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Regional Site Inspections for Perfluorinated Compounds at Multiple
Air National Guard Installations**

SUBJECT: **Final Site Inspection Report for Portland ANGB**

Mr. Crow

Attached please find the above referenced document.

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FINAL

**SITE INSPECTION REPORT
FOR
PERFLUOROOCTANE SULFONATE AND
PERFLUOROOCTANOIC ACID
AT
PORTLAND AIR NATIONAL GUARD BASE
PORTLAND, OREGON**



**142nd Fighter Wing
Portland Air National Guard Base
Portland, Oregon**

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**142nd Fighter Wing
Portland Air National Guard Base
Portland, Oregon**

January 2019

Contract Number W9133L-14-D-0007
Task Order Number 0011

Prepared for

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ACRONYMS

µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
AFFF	Aqueous Film-Forming Foam
AMSL	Above Mean Sea Level
ANADV88	Above North American Vertical Datum of 1988
ANG	Air National Guard
ANGB	Air National Guard Base
BB&E	BB&E, Inc.
BGS	Below Ground Surface
BOD5	Biochemical Oxygen Demand 5
CE	Civil Engineering
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CRSA	Columbia River Sand Aquifer
DoD	U.S. Department of Defense
DPT	Direct Push Technology
DQO	Data Quality Objective
EBS	Environmental Baseline Survey
EDR	Environmental Data Resources
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
FTA	Fire Training Area
FW	Fighter Wing
HA	Health Advisory
HDPE	High-Density Polyethylene
IDW	Investigation-Derived Waste
IRP	Installation Restoration Program
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NFA	No Further Action
ng/L	Nanograms per Liter
ODEQ	Oregon Department of Environmental Quality
OWS	Oil/Water Separator
PA	Preliminary Assessment
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutane Sulfonate
PFHpA	Perfluoroheptanoic Acid
PFHxS	Perfluorohexane Sulfonate
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PID	Photoionization Detector
POL	Petroleum, Oils, and Lubricants

PRL	Potential Release Location
QA	Quality Assurance
QC	Quality Control
RI	Remedial Investigation
RPD	Relative Percent Difference
RSL	Regional Screening Level
SI	Site Inspection
SVOC	Semivolatile Organic Compound
TestAmerica	TestAmerica Analytical Laboratories, Inc.
TCLP	Toxicity Characteristic Leaching Procedure
TGA	Troutdale Gravel Aquifer
UCMR3	Third Unregulated Contaminant Monitoring Rule
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
USAF	U.S. Air Force
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound
WP	Work Plan

EXECUTIVE SUMMARY

Leidos was contracted to conduct Phase III regional site inspections (SIs) for perfluorinated compounds at multiple Air National Guard Bases (ANGBs). This report documents SI activities conducted at nine potential release locations (PRLs) at the Oregon Air National Guard (ANG) at Portland International Airport, Portland, Oregon, herein referred to as Portland ANGB. The primary objective of the SI was to determine the presence or absence of perfluorinated compounds, more specifically per- and polyfluoroalkyl substances (PFAS) on the U.S. Environmental Protection Agency (EPA) Third Unregulated Contaminant Monitoring Rule (UCMR3), including perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluoroheptanoic acid (PFHpA), and perfluorohexane sulfonate (PFHxS), herein collectively referred to as PFOS/PFOA at each PRL, and based on the findings:

- Determine if PFOS/PFOA-contaminated groundwater has reached the Installation boundary;
- Provide a defensible no further action (NFA) decision for qualifying PRLs; and
- Develop data quality objectives (DQOs) for additional investigation for PRLs not meeting the NFA criteria or an interim response action, if appropriate.

To meet the objectives, Leidos performed SIs at the following nine PRLs:

- PRL 2: New Fire Department – Building 180,
- PRL 3: Hangar 250,
- PRL 4: Hangar 255,
- PRL 5: Old Fire Department and Swale – Building 290,
- PRL 6: Hangar 310,
- PRL 7: Hangar 380,
- PRL 8: Hangar 375,
- PRL 10: Ponds/Stormwater Retention Basins, and
- PRL 11: Former Installation Restoration Program (IRP) Site 7 Burn Pit.

The preliminary assessment (PA) site visit conducted by BB&E, Inc. (BB&E) in August 2015 evaluated a total of 10 PRLs and recommended 9 of these for further investigation under an SI as reported in the *Perfluorinated Compounds Preliminary Assessment Site Visit Report, Portland Air National Guard, Portland Air National Guard Base, Portland, Oregon* (BB&E 2016). PRL 1 was recommended for NFA due to no reported aqueous film-forming foam (AFFF) spills in the building. During the September 2017 SI kickoff meeting site visit, stakeholder discussions resulted in deviation from the PA with respect to the PRLs being evaluated in the SI. It was determined that investigation at the Petroleum, Oils, and Lubricants (POL) Storage – Building 431 (PRL 9) would be replaced with investigation at former IRP Site 7 (designated as PRL 11 in the SI Work Plan [WP]). PRL 9 was determined to not be a concern for PFOS/PFOA because no documented releases had occurred at Building 431. Although located outside the Installation boundary, ANG used the former IRP Site 7 Burn Pit for fire training exercises between 1957 and 1978. Portland ANGB requested that this area be investigated during the SI. The replacement of PRL 9 with former IRP Site 7 Burn Pit was agreed to by all parties in attendance at the kickoff meeting.

Therefore, based on recommendations from the PA and site visit conducted by BB&E in August 2015 and stakeholder discussions during the September 2017 kickoff meeting site visit, soil, groundwater, and surface water and sediment (if available) samples were collected. The collected samples were analyzed

for PFOS/PFOA compounds. Oregon has established an initiation level for four of the six UCMR3 compounds (PFOS, PFOA, PFHpA, PFNA) in surface water, which are to be considered guidance only. Oregon does not have criteria for soil, sediment, or groundwater. The detected PFOS/PFOA concentrations were compared against the more conservative screening criteria for PFOS, PFOA, and PFBS, including the EPA lifetime drinking water health advisory (HA) for PFOS and PFOA, the EPA regional screening level (RSL) for PFBS in tap water, and calculated screening levels using the EPA screening level calculator for PFOS, PFOA, and PFBS in soil, as shown in Table ES-1.

Table ES-1. PFOS/PFOA SI Screening Criteria

Parameter	Chemical Abstract Service Number	EPA RSL for Tap Water^a (ng/L)	EPA Health Advisory^b (ng/L)	Residential Risk-based Soil Screening Level^c (µg/kg)
PFOS	1763-23-1	NA	70.0 ^d	1,260
PFOA	335-67-1	NA		1,260
PFBS	375-73-5	400,000 ^e	NA	1,260,000

^a EPA RSL for tap water, May 2018.

^b *Drinking Water Health Advisory for Perfluorooctane Sulfonate* (EPA 2016a) and *Drinking Water Health Advisory for Perfluorooctanoic Acid* (EPA 2016b).

^c Residential risk-based soil screening levels determined by using the EPA RSL calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search) and the May 2018 EPA RSL tables (<https://epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2018>) for soil and sediment.

^d When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 70-ng/L health advisory value.

^e PFBS analytical results for groundwater and surface water have been compared to the tap water screening levels.

µg/kg = Micrograms per kilogram.

EPA = U.S. Environmental Protection Agency.

NA = Not available.

ng/L = Nanograms per liter.

PFBS = Perfluorobutane sulfonate.

PFOA = Perfluorooctanoic acid.

PFOS = Perfluorooctane sulfonate.

RSL = Regional screening level.

SI = Site inspection.

PFOS/PFOA compounds were detected above the laboratory detection limits in the soil, groundwater, sediment, and surface water samples collected during the SI. Samples from four monitoring wells (MW-POR07-01, MW-POR08-01, MW-POR10-01, MW-POR11-01) and three surface water samples (POR10-SW1, POR10-SW2, POR10-SW3) collected to evaluate PFOS/PFOA contamination near the Installation boundary indicates detection of all six PFOS/PFOA compounds. Two of these wells (MW-POR08-01, MW-POR11-01) are associated with PRLs located just outside the Installation boundary. The screening results indicate the consistent presence of PFOS and PFOA at concentrations exceeding the 70-ng/L EPA drinking water HA (EPA 2016a) near the Installation boundary.

In summary, additional investigations are recommended for soil and groundwater at PRLs 2, 3, 4, 5, 6, 7, 8, 10, and 11 and surface water/sediment at PRLs 5, 7, and 10. The recommendations are summarized in Table ES-2 and described briefly below:

- Further investigation at all nine PRLs is necessary to determine the nature and extent of PFOS/PFOA contamination due to detectable levels at all PRLs.

Table ES-2. SI Recommendation Summary Table

PRL No.	PRL Description	Constituents Above Screening Criteria	Sampling Recommendations and Objectives
2	New Fire Department – Building 180	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
3	Hangar 250	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
4	Hangar 255	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
5	Old Fire Department and Swale – Building 290	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Surface Water and Sediment: Determine PFOS/PFOA impact to sediment and surface water through additional sampling of surface water and sediment at the drainage swale.
6	Hangar 310	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
7	Hangar 380	Groundwater: PFOS + PFOA Surface Water: PFOS + PFOA Sediment: PFOS	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Surface Water and Sediment: Determine PFOS/PFOA impact to sediment and surface water through additional upgradient sampling of surface water and sediment and evaluate potential downgradient impacts.

Table ES-2. SI Recommendation Summary Table (continued)

PRL No.	PRL Description	Constituents Above Screening Criteria	Sampling Recommendations and Objectives
8	Hangar 375	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
10	Ponds/Stormwater Retention Basins	Groundwater: PFOS + PFOA Surface water: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Surface Water and Sediment: Determine PFOS/PFOA impact to surface water through additional upgradient sampling of surface water and sediment and evaluate potential downgradient impacts.
11	Former IRP Site 7 Burn Pit	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
General			Soil: Collect additional surface and subsurface soil samples to determine the nature and extent both vertically and horizontally of PFOS/PFOA contamination. Analyze for an expanded list of PFOS/PFOA compounds to evaluate for potential precursor compounds. Groundwater: (1) Collect additional groundwater samples in upgradient locations to quantify potential impacts from upgradient sources; (2) collect additional groundwater samples off Base through the installation of a limited number of new monitoring wells to determine if PFAS impacts beyond the Base boundary are increasing or decreasing. Surface Water/Sediment: (1) Collect additional surface water and sediment samples in upgradient locations to quantify potential impacts from upgradient sources; (2) collect additional surface water and sediment samples from downgradient locations and off Base to determine PFAS impacts beyond the Base boundary.

IRP = Installation Restoration Program.
PFOA = Perfluorooctanoic acid.
PFOS = Perfluorooctane sulfonate.
PRL = Potential release location.
SI = Site inspection.

- Develop an expanded conceptual site model that considers localized groundwater and surface water flow paths to select future sampling locations.
- Complete the delineation of nature and extent of PFAS as part of an Expanded SI or an RI that could consist of:
 - Additional soil and sediment sampling and analysis of an expanded list of PFAS constituents (in addition to the six UCMR3 constituents) to determine if significant source areas related to precursor substances are present. Precursor substances have been demonstrated to oxidize into PFOS and PFOA, and thus could provide a lingering source of these compounds to soil and groundwater.
 - An expanded groundwater sampling program (including analysis of an expanded list of PFAS constituents) to complete horizontal and vertical delineation of the PFOS/PFOA impacts. Further groundwater investigation at the Base boundary is recommended due to the presence of PFOS/PFOA in groundwater above their respective screening criteria.
 - The installation and sampling of upgradient and downgradient off-Base monitoring wells to better define the upgradient source of PFOS/PFOA as well as impacts of PFOS/PFOA that have migrated off Base.
 - The sampling of upgradient and downgradient off-Base surface water and sediment (including analysis of an expanded list of PFAS constituents) to better determine if there is an upgradient source of PFOS/PFOA, as well as impacts of PFOS/PFOA in surface water that have migrated off Base.
- Conduct preliminary site-specific risk assessment calculations in order to identify chemicals of potential concern (COPCs) in every medium and establish preliminary remedial goals for screening purposes.

DQOs are proposed based on the results of the SI and are presented in Table ES-2. In general, additional samples are required at each PRL in order to establish the nature and extent of PFOA/PFOS constituents for each applicable medium and determine if a complete receptor pathway exists. For soil, additional samples are proposed to determine if a source area exists and, if so, the vertical and horizontal extent for both the vadose and saturated zones. Additional surface water and sediment samples should be collected at PRLs 5, 7, and 10 to further evaluate PFOS/PFOA concentrations in surface water and sediment. As part of the conceptual site model, future investigations also will consider potential groundwater-to-surface water migration, including preferential migration of groundwater contaminants to surface water via subsurface utilities.

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1.0 INTRODUCTION

Leidos has prepared this Site Inspection (SI) Report to satisfy the requirements of Task Order 0011 of National Guard Bureau Contract Number W9133L-14-D-0007. Under this Task Order, Leidos was contracted to conduct Phase III regional SIs for perfluorinated compounds at multiple Air National Guard Bases (ANGBs). This report documents SI activities conducted at nine potential release locations (PRLs) at the Portland ANGB at Portland International Airport, Portland, Oregon, herein also referred to as the Installation or Base. Activities were performed at seven potential release locations (PRLs) on Base (property owned by the Port of Portland and currently leased by the U.S. Air Force [USAF]). Two additional PRLs (Hangar 375 and Former Installation Restoration Program [IRP] Site 7 Burn Pit) are located off Base. Figure 1 presents the Installation location and locations of the PRLs at Portland ANGB. Except as noted in Section 5.1.2, all field activities were conducted in accordance with the *Work Plan for Fiscal Year 2017 Phase III Regional Site Inspections for Perfluorooctane Sulfonate and Perfluorooctanoic Acid at Portland Air National Guard Base, Portland, Oregon* (Leidos 2018).

1.1 PROJECT OBJECTIVES AND SCOPE

The primary objective of the SI was to determine the presence or absence of perfluorinated compounds, more specifically per- and polyfluoroalkyl substances (PFAS) on the U.S. Environmental Protection Agency (EPA) Third Unregulated Contaminant Monitoring Rule (UCMR3), including perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), perfluoroheptanoic acid (PFHpA), and perfluorohexane sulfonate (PFHxS), herein collectively referred to as PFOS/PFOA in soil, groundwater, and surface water and sediment (if applicable).

Surface and subsurface soil, groundwater, and surface water and sediment (if applicable) were sampled at each PRL. Specific media sampled at each PRL were dependent on the type of PRL. Samples were analyzed to determine the presence or absence of PFOS/PFOA in environmental media at the PRLs identified during the 2015 preliminary assessment (PA) (BB&E 2016) and during the September 2017 kickoff meeting site visit and to:

- Determine if PFOS/PFOA-contaminated groundwater has reached the Installation boundary;
- Provide a defensible no further action (NFA) decision for qualifying PRLs; and
- Develop data quality objectives (DQOs) for additional investigation for PRLs not meeting the NFA criteria or an interim response action, if appropriate.

The scope of work consisted of three inter-related tasks: (1) prepare an SI Work Plan (WP), (2) conduct SI and data collection activities, and (3) evaluate data from the field effort and applicable historical information to present conclusions and recommendations in an SI Report.

The original project scope was to evaluate only PRLs located on Base. Based on stakeholder discussions, two PRLs (Hangar 375 and former IRP Site 7 Burn Pit) located off Base were included in the SI. Sampling of drinking water sources (other than the on-Base potable water supply that was used for decontamination activities) was not included, and determination of nature and extent of any identified contamination was not within the scope of this SI.

The PA evaluated a total of 10 PRLs and recommended 9 of these for further investigation under an SI, as reported in the *Perfluorinated Compounds Preliminary Assessment Site Visit Report, Portland Air*

National Guard, Portland Air National Guard Base, Portland, Oregon (BB&E 2016). During the September 2017 kickoff meeting site visit, stakeholder discussions resulted in deviation from the PA with respect to the PRLs being evaluated in the SI. It was determined that investigation at the Petroleum, Oils, and Lubricants (POL) Storage – Building 431 (PRL 9) would be replaced with investigation at the former IRP Site 7 Burn Pit (designated as PRL 11 in the SI WP). PRL 9 was determined to not be a concern for PFOS/PFOA because no documented releases had occurred at Building 431. Although located outside the Installation boundary, the former IRP Site 7 Burn Pit was used by the Air National Guard (ANG) for fire training exercises between 1957 and 1978. Portland ANGB requested that this area be investigated during the SI. The replacement of PRL 9 with the former IRP Site 7 Burn Pit was agreed to by all parties in attendance at the kickoff meeting. The nine PRLs listed in Table 1 and depicted in Figure 2 were selected for SI activities based upon the PA and site visit conducted by BB&E, Inc. (BB&E) in 2015 and stakeholder discussions during the 2017 kickoff meeting site visit. This SI Report briefly summarizes the PA, describes SI field activities, presents analytical results of environmental sampling, and provides recommendations for each PRL.

1.2 REGULATORY OVERVIEW AND SCREENING CRITERIA

In 2012, EPA published the UCMR3, which required public water supplies across the country to sample for a list of 30 unregulated contaminants, including 6 chemicals of concern (COCs) relevant to this SI (PFOS, PFOA, PFBS, PFNA, PFHpA, and PFHxS; i.e., PFOS/PFOA). Results of UCMR3-required sampling indicated detections of PFOS/PFOA at numerous locations, including several near U.S. Department of Defense (DoD) facilities. PFOS/PFOA detections at DoD facilities are often linked to the use of aqueous film-forming foam (AFFF), which may contain one or more of these chemicals. AFFF is a firefighting agent used to suppress fires involving petroleum hydrocarbons.

Detected concentrations of PFOS/PFOA in environmental samples collected during the Portland ANGB SI were compared against soil and water screening criteria for PFOS, PFOA, and PFBS, as described below and listed in Table 2.

The May 2018 EPA generic regional screening level (RSL) table lists a residential risk-based screening level for tap water for PFBS of 400 micrograms per liter ($\mu\text{g/L}$) (400,000 nanograms per liter [ng/L]; target hazard quotient = 1). Currently, no legally enforceable federal standards exist for PFOS/PFOA in water. However, under the Safe Drinking Water Act, EPA issued a series of health advisories (HAs) for PFOS/PFOA, including the most recent in May 2016. To provide Americans, including the most sensitive populations, with a margin of protection from a lifetime of exposure to PFOS/PFOA in drinking water, EPA established an HA level for PFOS and PFOA (combined) of 70 ng/L . The HA of 70 ng/L applies to PFOS and PFOA individually as well as combined. If an individual compound is detected $>70 \text{ ng/L}$, the screening criteria are exceeded. However, if individual compounds are $<70 \text{ ng/L}$ but the sum of the compounds is $>70 \text{ ng/L}$, the screening criteria are exceeded. For example, if PFOS = 50 ng/L and PFOA = 25 ng/L , the screening criteria are exceeded. Therefore, screening levels for groundwater and surface water are as follows:

- PFOS and PFOA = 70 ng/L ; and
- PFBS = 400,000 ng/L .

There are also no legally enforceable federal standards for PFOS/PFOA in soil or sediment. The May 2018 EPA generic RSL table lists a residential risk-based screening level for soil for PFBS of 1,300 milligrams per kilogram (mg/kg) (1,300,000 micrograms per kilogram [$\mu\text{g/kg}$]). Following the process utilized at other ANG Installations around the country, Leidos will use residential risk-based screening levels for soil determined using the EPA RSL calculator and the May 2018 RSL tables. The calculated screening value for PFBS is slightly less than the value listed in the generic RSL table. RSLs are only

available for three of the six COCs listed above. The calculated screening levels for these three COCs are as follows:

- PFOS = 1,260 µg/kg;
- PFOA = 1,260 µg/kg; and
- PFBS = 1,260,000 µg/kg.

No surface water or sediment screening criteria have been established by EPA at this time.

As of the preparation of this SI Report, no site-specific soil, sediment, or groundwater screening levels have been developed in Oregon. However, Oregon has established initiation levels for PFOS, PFOA, PFNA, and PFHpA in surface water. The initiation levels for surface water are as follows:

- PFOS = 24,000 ng/L;
- PFOA = 300,000 ng/L;
- PFNA = 1,000 ng/L; and
- PFHpA = 300,000 ng/L.

The initiation levels for surface water are provided for guidance only.

The SI results will be compared against the screening criteria provided in Table 2. Sediment results will be compared with the soil screening criteria and the surface water results will be compared with the groundwater screening criteria provided in this table.

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2.0 INSTALLATION DESCRIPTION

2.1 LOCATION

Portland ANGB is the home of the 142nd Fighter Wing (FW) in Portland, Oregon. Portland ANGB is located immediately adjacent and south of Portland International Airport and occupies approximately 245 acres of land leased from the Port of Portland (BB&E 2016). Portland International Airport covers roughly 3,000 acres; has three runways; and is located 6 miles northeast of downtown Portland, Oregon in Multnomah County. The Portland ANGB location is shown in Figure 1.

2.2 ORGANIZATION AND HISTORY

Portland International Airport started as a municipal airport in the early 1940s. The 142nd FW of ANG was organized at Portland-Columbia Airport in 1940 as the 123th Observation Squadron, then renamed when it deployed overseas during World War II. Post war, in 1950, most of the area currently occupied by Portland ANG was converted into an active U.S. Air Force Base, until Portland ANG resumed control again in 1964 (HMTc 1987). Since the Base was established, Portland ANG has leased or occupied space within the Portland International Airport facility. Today, Portland International Airport is the busiest commercial airport for passenger and air cargo traffic in the State of Oregon. It is a civil-military airport that serviced roughly 18.3 million passengers in 2016. The 142nd FW is currently an air reserve component of the U.S. Air Force and flies F-15C/D Eagle fighters (ANG 2010).

DoD began investigations at military Bases under the IRP with the goal of identifying, evaluating, and remediating areas of contamination (the program is now referred to as the Environmental Restoration Program [ERP]). These investigations included PAs, site investigations, removal action investigations, and remedial investigations (RIs). Prior to the BB&E 2016 PA, potential releases of PFOS/PFOA from use and storage of AFFF had not been evaluated at Portland ANGB.

Base operations that could have contributed to PFOS/PFOA contamination of soil, groundwater, sediment, and surface water include fire training areas (FTAs) and non-FTAs. FTA PRLs are sites where AFFF was likely used for fire suppression during training activities. No FTAs are located on Portland ANGB property; however, during the September 2017 Installation site visit, the stakeholders agreed to include the former IRP Site 7 Burn Pit (PRL 11) in this SI despite the site's location off Base; although the site is currently located off Base, the site was historically located on property occupied by ANG/USAF.

Non-FTA PRLs identified at Portland ANGB are sites where AFFF was stored, released, and/or likely to have been released, and include new Fire Department Building 180 (PRL 2), hangars (PRLs 3, 4, 6, 7, and 8), the old fire department and swale (PRL 5), and ponds/stormwater retention basins (PRL 10) (BB&E 2016).

When AFFF is released to the environment, PFOS/PFOA can migrate into soil and groundwater. The amount of PFOS/PFOA that migrates to groundwater depends on the type and amount of AFFF used, where it was used, the type of soil, and other factors. PFOS/PFOA may migrate readily from soil to groundwater. The primary exposure pathway for PFOS/PFOA is the ingestion of contaminated drinking water.

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3.0 ENVIRONMENTAL SETTING

3.1 CLIMATE

Portland ANGB is situated in a temperate climate region with mild winters and summers. The area is subject to low-volume, high-frequency rainfall events in the early spring and fall. The average temperature of Multnomah County, Oregon is 53.60°F, which is higher than most of Oregon and is similar to the national average temperature of 54.45°F. Annual rainfall amounts in Multnomah County are 45.59 in. with 105.04 days of 0.1 in. of rain or more of precipitation. Average annual snowfall in the area is 2.80 in. Average wind speed for the area is 14.86 miles per hour and is usually out of the west and northwest (USA.com 2017).

3.2 TOPOGRAPHY

Portland ANGB is located on a levee-protected floodplain of the Columbia River. Portland ANGB and Portland International Airport are bordered by the Columbia River to the north and the Columbia Slough to the south. The local floodplain has little to no natural topography and gently slopes north toward the Columbia River. Portland International Airport and Portland ANGB average 30 ft above mean sea level (AMSL) (BEM and Arcadis 2013).

3.3 GEOLOGY

Multnomah County and Portland, Oregon are located on a topographic boundary known as the Columbia Plateau, a region marked by Eocene volcanic features and late Miocene fluvial deposits from the Cascade Mountain Range. Portland ANGB is situated on quaternary age terrace alluvium, composed of floodplain and terraced bedded sands, silts, and clays ranging in thickness from 100 to 200 ft. The terrace alluvium locally overlies the Troutdale Formation, which is approximately 800 to 900 ft thick, and while nearly horizontal has very gentle slopes to the west and southwest. The Troutdale Formation consists of well-sorted, coarse-grained sandstone and a conglomerate with well-rounded quartzite pebbles set in a very fine clay mineral matrix. The upper few feet of the formation are highly weathered and nearly indistinguishable from prolonged exposure. The Troutdale Formation strikes to the north and gently dips to the west and southwest at 2 degrees (DOI 1963).

Borings drilled during the Leidos SI did not reach refusal or bedrock and were typically drilled to 5 to 15 ft below ground surface (BGS). The boring logs show some locations with plastic clay and others with interbedded moist sand, silt, and clay, which confirm the presence of bedded layers. Some borings had red nodules within clay layers. Monitoring well bores were advanced to 15.5 ft BGS. Borings consisting mostly of clay followed the trend of gray/brown silty clay giving way to some brown loose clay, then brown tight clays. Borings exhibiting this include POR05-SB1 and POR05-SB2; POR4-SB2 and POR4-SB3; POR11-SB1, POR11-SB2, and POR11-SB3 (which contained some angular gravel); POR03-SB1 and POR03-SB2; MW-POR04-01; and POR04-SB1. Borings exhibiting interbedding of sands and clays include MW-POR010-SB1, POR5-SB3, POR6-SB1 and POR6-SB2; POR07-SB1 and POR07-SB2; POR08-SB1 and POR08-SB2; POR02-SB1 (which also contained some angular gravel); and POR02-SB2. The wells installed had depths to water between 4.0 and 14.0 ft BGS.

3.4 SOIL

Soils at Portland ANGB have been classified during previous site investigations and are separated into two distinct categories. The primary soil underlying most of Portland ANGB is the Pilchuck Soil Complex. The Pilchuck Soil Complex is composed of 1 ft of silty topsoil underlain by 5 ft of well-sorted, highly permeable, dark brown sands. The other soil type found at Portland ANGB is the Sauvie-Rafton Complex, consisting of 75 to 90 in. of poorly drained soils that are silty loam to silty clay in texture.

Sauvie-Rafton soils are a common component of floodplain structures along the Columbia River, much like the one on which Portland ANGB is situated (ERM 2013).

These soil descriptions are consistent with field logs, as some borings had silty sand underlain by dark brown sands and others had a majority of gray silt/clay mix of differing plasticity.

3.5 SURFACE WATER HYDROLOGY

Natural and significant surface water bodies and both navigable and non-navigable waterways are located at and adjacent to Portland ANGB. Surface water flow from Portland ANGB and Portland International Airport eventually drains to the Columbia Slough. The Columbia Slough is directly south of Portland ANGB and is a complex of narrow and shallow channels extending approximately 18 miles within the southern floodplain of the Columbia River. The Columbia River is the major surface water feature located to the north of Portland ANGB and Portland International Airport. The Columbia Slough receives water from springs to the northeast of Portland International Airport and local groundwater seepage from shallow saturated zones, as well as local surface water runoff from Portland ANGB.

Surface water flow at Portland ANGB is dictated by the Base's man-made surface drainage system. Stormwater is captured by drainage ditches throughout the property, which then directs the flow to two man-made stormwater detention ponds on Portland ANGB. The drainage ditch footprint occupies approximately 1.8 acres and consists of two branches. The main branch is approximately 2,800 ft long, and the north branch extends approximately 1,700 ft. The two branches converge at the point of discharge to the detention ponds. The outfall from the upper detention pond can be closed, allowing the pond to be used as a containment area. Stormwater is discharged from the upper pond to the lower pond before it is conveyed to Portland International Airport's detention pond and then to Columbia Slough (ERM 2013).

3.6 HYDROGEOLOGY

Significant hydrogeologic units are present in the vicinity of Portland International Airport. These units include, in descending order, the Overbank Deposits, the Columbia River Sand Aquifer (CRSA), the Troutdale Gravel Aquifer (TGA), Confining Unit 1, the Troutdale Sandstone Aquifer, Confining Unit 2, and the Sand and Gravel Aquifer. Several of the hydrogeologic units underlying Portland International Airport are part of a regional aquifer system that serves as the city of Portland's supplemental water supply. Shallow groundwater at the Base occurs within the shallow alluvial terrace deposits and has been encountered during various investigations at depths ranging from 2 to 10 ft BGS. The inferred groundwater flow direction in the Overbank Deposits is predominantly toward the west and northwest. This differs from the CRSA, where recorded water level measurements suggest that the groundwater flow direction fluctuates between northeast and south. Generally, the water table is lowest in the late summer and fall and highest in the winter and spring (BB&E 2016).

According to the 2006 environmental baseline survey (EBS), the shallowest water-bearing zone is a discontinuous, unconfined to semi-confined water-bearing sand unit, the top of which ranges in depth from 5.5 to 9 ft BGS and ranges in thickness from 3 to 19 ft. The discontinuous lenses of the upper zone are in scattered locations throughout the northern, eastern, and southwestern portions of Portland ANGB (CH2M Hill 2006).

Groundwater flow direction varies between water-bearing units and tends to fluctuate seasonally and in response to changes in the Columbia River stage caused by releases from Bonneville Dam. In the shallow aquifer, groundwater predominantly flows toward the west and northwest, although the flow direction varies considerably locally. Water levels in the shallow zone are influenced by recharge/discharge through drainage ditches throughout the subject property and the Columbia Slough to the south, although

the hydraulic connection between the slough and the shallow aquifer may be muted by low-permeability sediments in the bed of the slough (CH2M Hill 2006).

The groundwater information collected from the nine new monitoring wells installed during the Leidos SI field activities confirmed a west-northwest flow of shallow groundwater. The shallow water table occurs at varying depths within Portland ANGB. Soil boring logs indicate shallow groundwater was encountered at depths ranging from 4 ft BGS in POR06-SB2 to 14 ft BGS in POR11-SB2. Groundwater was encountered in all soil borings between these depths. Groundwater levels collected before purging and sampling monitoring wells installed during the SI indicate the depth to shallow groundwater ranged from 3.98 ft BGS in MW-POR05-01 to 12.63 ft BGS in MW-POR10-01. Groundwater elevations were 13.05 ft Above North American Vertical Datum of 1988 (ANAVD88) in MW-POR05-01 and 9.15 ft ANAVD88 in MW-POR10-01.

3.7 CRITICAL HABITATS AND ENDANGERED/THREATENED SPECIES

According to the U.S. Fish and Wildlife Service (USFWS), the following federally listed threatened, endangered, or proposed species are known to or are believed to occur in Multnomah County, Oregon (USFWS 2017a):

- Mammals:
 - Columbian white-tailed deer (*Odocoileus virginianus leucurus*) – Threatened.
- Snails:
 - Puget oregonian (*Cryptomastix devia*) – Threatened.
- Fish:
 - Bull trout (*Salvelinus confluentus*) – Threatened.
- Birds:
 - Northern spotted owl (*Strix occidentalis caurina*) – Threatened,
 - Yellow-billed cuckoo (*Coccyzus americanus*) – Threatened,
 - Marbled murrelet (*Brachyramphus marmoratus*) – Threatened, and
 - Streaked horned lark (*Eremophila alpestris strigata*) – Threatened.
- Plants:
 - Nelson's checker-mallow (*Sidalcea nelsoniana*) – Threatened,
 - Golden paintbrush (*Castilleja levisecta*) – Threatened, and
 - Kincaid's lupine (*Lupinus sulphureus ssp. kincaidii*) – Threatened.

The potential for these species to occur in Multnomah County does not mean they are present at Portland ANGB.

The USFWS National Wetlands Inventory indicates roughly 0.54 acres are designated as wetlands along the ditch lines within the Portland ANGB property (USFWS 2017b).

3.8 WATER WELLS

The PA Report (BB&E 2016) indicates 153 federal or public water wells are within a 1-mile radius of the Base. One well is listed on the U.S. Geological Survey database, which usually lists monitoring or test wells. Other than a construction date of 1959, no additional relevant information was provided about this well. The remaining 152 water wells listed in the Environmental Data Resources (EDR) Report are on the

state's database. The majority of these wells appeared to be monitoring wells and none were listed as potable wells (BB&E 2016).

The city of Portland has a well field approximately 0.75 miles east/northeast of the Base, which is used as a supplemental water supply for the city of Portland. In addition, information provided from the 2006 EBS shows several additional water wells around the Base. Two water wells were identified in the EBS within a 1-mile radius of the property. However, these wells are not listed as existing wells on the State of Oregon Water Resources Department, online Well Log Query (<http://www.wrd.state.or.us>). In addition, Mr. Roger Rein, the 142nd FW Environmental Manager, provided a list of eight unregistered wells that are located between 0.75 and 1.25 miles from the Base. According to Mr. Rein, some of these wells are used for domestic consumption (BB&E 2016).

4.0 PRELIMINARY ASSESSMENT

In 2016, BB&E conducted a PA to identify potential sites of historical environmental releases of PFOS/PFOA related to AFFF usage and storage at Portland ANGB (BB&E 2016). The PA evaluated a total of 10 PRLs and recommended 9 of these for further investigation under an SI (Table 1; see also Figure 1). During the September 2017 site visit, stakeholder discussions resulted in deviation from the PA with respect to the PRLs being evaluated in the SI. It was determined that investigation at the POL Storage – Building 431 (PRL 9) would be replaced with investigation at the former IRP Site 7 Burn Pit (designated as PRL 11 in the SI WP) (Leidos 2018). At the time of the 2016 PA, no documentation was available showing that soil, groundwater, sediment, and surface water at Portland ANGB were previously tested for PFOS/PFOA; therefore, these compounds could be present in media at any of these PRLs.

BB&E researched the potential existence of any documented FTAs or any other use or release of AFFF. No evidence was found that a current or former FTA that utilized AFFF was located within the footprint of the Portland ANGB site boundary; however, an offsite FTA (former IRP Site 7 Burn Pit) was included in this SI based on stakeholder discussions. The PA site visit included onsite interviews with active and former personnel from the ANGB and other parties with relevant historical site knowledge.

The following sections briefly describe the operational history and waste characteristics of the PRLs included in this SI, as presented in the PA Report (BB&E 2016) and PRL 11 from the SI WP. PRL numbers correspond to the area of concern designation used in the PA Report, and all building descriptions, AFFF inventories, and release histories reflect conditions at the time of the August 2015 BB&E site visit.

4.1 PRL 2: NEW FIRE DEPARTMENT – BUILDING 180

The new Fire Department – Building 180 was constructed in 2005. According to personnel that have worked at the Base Fire Department since the late 1980s, the AFFF stored at this location is currently in Fire/Crash Response vehicles, including three crash trucks (two 25-gal trucks and one 250-gal truck), one fire engine (250 gal), and one foam trailer (2,000 gal). One former crash truck, awaiting disposal at the motor pool, contained 130 gal. Fire Department personnel indicated that minor spills had occurred during filling the vehicles over the years from onsite containers (now removed) and minor leaks from the equipment. In addition, at least three occurrences of AFFF being discharged to the stormwater sewer system were documented in the Annual Stormwater Reports.

4.2 PRL 3: HANGAR 250

Hangar 250 was built in 1985. AFFF is stored in fire suppression equipment in the mechanical room of this hangar. According to the label, the tank has a design capacity of 200 gal, but the net contents are 55 gal of AFFF. Minor leaks of AFFF have occurred in this room, with no reported inadvertent releases in the hangar. Currently, no AFFF is present in the hangar, although one empty 55-gal barrel is currently present. No records of spills are reported to have occurred at this location.

4.3 PRL 4: HANGAR 255

Hangar 255 was constructed in 1956. AFFF is stored in fire suppression equipment in the mechanical room of this hangar. The placard on the tank states that it contains 600 gal of AFFF manufactured in 1994. Minor leaks of AFFF have occurred in this room, with an inadvertent release in the main hangar.

On October 19, 2005, Environmental Management (EM) personnel noticed foam on the pavement near Hangar 255 and questioned the local office personnel. The investigation indicated that the AFFF system

in the hangar had been tested earlier that day as part of an annual testing program and 0.5 gal of pure AFFF mixed with 49.5 gal of water overflowed the system and was rinsed off the pavement into a storm drain located on the south side of Hangar 255 (see schematic in Appendix C-1). EM personnel reported the incident to the Oregon Department of Environmental Quality (ODEQ), and further AFFF testing that day was suspended. EM personnel inspected the stormwater ditches and stormwater detention ponds to look for evidence of foam. On October 20, 2005, the ditches and ponds were again inspected and no foam was evident. A sample was collected at Outfall 10 and analyzed for biochemical oxygen demand 5 (BOD5). The actual BOD5 result was greater than 300 milligrams per liter (mg/L), since the high oxygen concentrations saturated the test and could not yield a true value. On October 21, 2005, the stormwater ditch feeding the north pond showed evidence of foam. Six aerators in the north pond and eight aerators in the south pond kicked up small patches of persistent foam covering an estimated area of 16 ft². By the afternoon that day, the foam had dissipated. A sample was again collected and analyzed for BOD5, which yielded a concentration of 10 mg/L. The problem was discussed with Civil Engineering (CE) management personnel. CE personnel redesigned the plumbing configuration to prevent future annual AFFF testing at Hangar 255 from discharging to the storm sewer system.

4.4 PRL 5: OLD FIRE DEPARTMENT AND SWALE – BUILDING 290

Building 290 was built in 1986 and housed the old Fire Department from approximately 1986 to 2005. According to personnel that have worked in this building since the late 1980s, AFFF was historically stored at this location in Fire/Crash Response vehicles. Fire Department personnel indicated that minor spills had occurred during the filling of vehicles over the years from onsite containers (now removed) and minor leaks from the equipment. In addition, personnel indicated at least one spill of AFFF of unknown quantity discharged to the drainage swale northwest of the building.

4.5 PRL 6: HANGAR 310

Hangar 310 was built in 1988. AFFF is stored in fire suppression equipment in the mechanical room of this building. Three tanks are located in the room, which are very similar in size to the tanks in Hangar 375, although no volumes were listed on the tanks. It is presumed that two of the tanks contain 800 gal and one contains 600 gal. The date of manufacture listed on the tanks is 1987. Minor leaks of AFFF have occurred in the room, with an inadvertent release in the main hangar. Most of the inadvertent release of AFFF likely was hosed off into the floor drain within the hangar, which is connected to the sanitary sewer system. Some of the AFFF also would have likely made its way onto the ramp to the north of Hangar 310 and then into the storm sewer system.

4.6 PRL 7: HANGAR 380

Hangar 380 was built in 1986. AFFF was stored in fire suppression equipment in the mechanical room of this building. No tanks are currently in the room. The tanks reportedly were removed in 2005. Personnel interviewed did not know of any discharges in the room or in the main hangar.

4.7 PRL 8: HANGAR 375

Hangar 375 was built in 1988 and is located outside the Portland ANGB boundary. , AFFF was stored in fire suppression equipment in the mechanical room of this building. Three tanks are in the room with no labels listing their volumes. Two of the tanks presumably contain 800 gal and one contains 600 gal. Minor leaks of AFFF have occurred in the room, and an inadvertent release had occurred in the main hangar. Most of the inadvertent release of AFFF likely was hosed off into the floor drain within the hangar, which is connected to the sanitary sewer system. Some of the AFFF also would have likely made its way onto the ramp to the north of Hangar 375 and then into the storm sewer system.

4.8 PRL 9: BUILDING 431 – POL STORAGE

POL is stored in Building 431, which was constructed in 1994. This building formerly contained the AFFF system tank that provided fire protection for the fuel tanks. No leaks or inadvertent discharges were reported, and the system was removed in 2013 (BB&E 2016). During the September 2017 Installation site visit/kick-off meeting with Portland ANG and ODEQ, the stakeholders concluded that PRL 9 – Building 431 would not be carried over to the SI for further investigation. This conclusion is based on an inspection of AFFF storage/use at this location, an interview with an ANG employee during the SI, and supporting information presented in the PA Report (BB&E 2016).

4.9 PRL 10: PONDS/STORMWATER RETENTION BASINS

Two man-made, shallow ponds are located in the west-central portion of the Base that receive 95% of the Base's stormwater discharge. These ponds are fed by ditches, which converge just north of the ponds where the stormwater is discharged into the ponds through a pipe. All of the previously aforementioned releases to the storm sewer system eventually made their way to these two ponds. The ponds are located near the western boundary of the Base, as shown in Figure 2. Stormwater from these ponds discharges to Port of Portland property, where it may be discharged to the Columbia River Slough or the Columbia River.

4.10 PRL 11: FORMER IRP SITE 7 BURN PIT

The former burn pit area is southeast of Buildings 210 and 215 and is mostly outside of the Portland ANGB boundary. The majority of the former IRP Site 7 Burn Pit lies on Port of Portland property. Immediately north of the former burn pit is the McBride Slough. The burn pit was used for fire training exercises between 1957 and 1978. Several thousand gallons of flammable liquids, including waste oil, jet propulsion fuel No. 4 jet fuel, and solvents, reportedly were burned each year in the pit (HMTC 1987). The former burn pit area has since been filled with gravel and compacted (ERM 2001).

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5.0 SITE INVESTIGATION FIELD PROGRAM

This section summarizes the SI field activities, including soil, groundwater, surface water, and sediment sampling, at Portland ANGB. Analytical results for each PRL are presented and identify the presence or absence of PFOS/PFOA and results for PFOS, PFOA, and PFBS that exceed the screening criteria shown in Table 2 and described in Section 1.2 of this SI Report.

All sampling and analytical activities were conducted in accordance with the procedures specified in the SI WP (Leidos 2018), except as noted in Section 5.1.2. Boring logs and monitoring well construction logs are provided in Appendix A and groundwater sampling logs are provided in Appendix B. The groundwater monitoring well survey report is included in Appendix C. The data validation report is provided in Appendix D. The full data package is provided in Appendix E.

5.1 GENERAL APPROACH

5.1.1 Field Sampling

SI field activities included the following:

- Surface and subsurface soil sampling;
- Confirmation of local groundwater flow direction at the Installation using historical data and/or temporary piezometers;
- Groundwater sampling from newly installed monitoring wells located downgradient from the PRL;
- Groundwater sampling from newly installed monitoring wells at the Installation boundary;
- Sediment and surface water sampling (if available); and
- A Global Positioning System survey of soil borings, sediment, and surface water locations (newly installed wells require a professional licensed surveyor to survey the horizontal location and elevation).

Sample locations were based on known historical or potential releases, and site conditions as observed during the PA. Table 3 summarizes the SI sampling activities at Portland ANGB. Figure 2 shows an overview of the Portland ANGB SI sample locations. Prior to intrusive activities, an underground utility locator marked and cleared all boring locations.

A total of 19 soil borings were advanced (soil samples from PRL 10 were collected while installing monitoring well MW-PRL10-01). Soil borings were advanced using direct push technology (DPT) drilling to first water or refusal, whichever was encountered first. Soil borings were logged for soil lithology. Boring logs are included in Appendix A. Two grab soil samples were collected from each boring—one from within the 0- to 2-ft BGS interval, and one from within the 2-ft interval immediately above the water table.

All soil samples were screened by a photoionization detector (PID) as a health and safety precaution due to the potential presence of volatile organic compounds (VOCs). Following collection of soil samples, boreholes not co-located with monitoring wells were abandoned by backfilling the bore holes with bentonite and capping with surrounding soil.

Water level data from temporary piezometers installed during the SI were used to confirm the local groundwater flow direction is to the west-northwest, as documented in the historical reports. Nine permanent monitoring wells were installed and water levels measured to determine groundwater flow direction. The new wells were developed and sampled following ANG guidance, as prescribed in the SI WP (Leidos 2018).

In addition to soil and groundwater samples, one sediment sample was collected from the drainage swale associated with Building 290 (PRL 5); a surface water sample was planned to be collected but no surface water was present at the time of the SI, one surface water and one sediment sample were collected from the catch basin at Hangar 380 (PRL 7), and five sediment and five surface water samples were collected from the ponds/stormwater retention basins (PRL 10). Additional details on the field activities for each PRL are provided in Sections 5.3 through 5.11.

5.1.2 Deviations from the Work Plan

The following deviations were observed during field activities:

- No surface water was observed in the drainage swale associated with Building 290 (PRL 5). No surface water samples were collected, as described in the SI WP (Leidos 2018).
- Soil borings were not drilled for the ponds/stormwater retention basins (PRL 10), as described in the SI WP (Leidos 2018), to avoid potentially damaging the liner within the drainage ditch. Instead, two soil samples were collected from the boring for the monitoring well (MW-POR10-01) installation, and two additional surface water and sediment samples were collected from the drainage ditch that discharge to the stormwater retention basins.
- Due to an oversight, the field reagent blank was not collected per the Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP). Note, this field quality control (QC) blank is not required under the Quality Systems Manual (QSM) Version 5.1 (DoD 2017) and does not impact the validation qualifiers assigned to the sample data; therefore, NFA is required.
- Due to field oversight, duplicate and matrix spike/matrix spike duplicate (MS/MSD) was not collected for water matrix. The laboratory analyzed a laboratory control sample (LCS) and laboratory control sample duplicate (LCSD), which is used to evaluate the precision of the analytical system when there is no MS/MSD. All LCS/LCSD percent recovery and relative percent difference (RPD) results were within control limits.

5.1.3 Data Analysis

5.1.3.1 Laboratory

Environmental samples were submitted to TestAmerica Analytical Laboratories, Inc. (TestAmerica), in West Sacramento, California. TestAmerica is accredited under the DoD Environmental Laboratory Accreditation Program and maintains a National Environmental Laboratory Accreditation Program certification.

5.1.3.2 Screening criteria

Analytical data for three of the six PFOS/PFOA compounds (PFOS, PFOA, PFBS) were compared to appropriate HA or risk-based screening criteria (Section 1.2) to determine whether further investigation is required. No HA or RSL criteria currently exist for PFHpA, PFHxS, or PFNA.

5.1.3.3 Data validation

A UFP-QAPP was developed for this project as Appendix A of the SI WP (Leidos 2018). The UFP-QAPP was written to apply to all 15 Installations included in the scope of the Phase III SI contract. Specifics on the number and type of samples to be collected in characterizing the site, and the number and type of quality assurance (QA)/QC samples to be used to evaluate the quality of the data obtained, were included in the SI WP (Leidos 2018). Soil and sediment were collected in one 4-oz. high-density polyethylene (HDPE) container with HDPE cap. Groundwater and surface water samples were collected in two 250-mL HDPE containers with HDPE caps. The following samples were collected during the Portland ANGB SI sampling conducted in May 2018:

- Forty soil samples,
- Seven sediment samples,
- Nine groundwater samples,
- Six surface water samples,
- Five soil field duplicate samples,
- Three soil MS/MSD pairs,
- Four equipment rinsates, and
- One field blank.

The results of the data quality evaluation indicate that the overall quality of the data enables its use to confirm the presence or absence of contamination. Through data verification, validation, and review, the analytical information has been qualified as appropriate. Data are considered usable if results are unqualified or qualified as estimated. For groundwater and surface water, 100% of the data were considered usable. For sediment and soil, 100% of the data were considered usable. The overall quality of the data meets or exceeds the established project objectives.

Quality Control

Five soil field duplicate samples were collected. Field duplicate analytical results were generally consistent with their associated parent samples, indicating no significant issues with field and laboratory precision. One of the soil duplicate pairs had two RPD value above the guideline (51% for PFHxS and 69% in PFOS in POR02-SB1-01/01D). Both results were non-detect in the duplicate sample. Data are not qualified on the basis of field duplicate results alone, since the *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 1999), and DoD QSM Version 5.1 (DoD 2017) do not include control limits for field duplicate RPD values. Three MS/MSD pairs were collected for soil. The MS/MSD results are discussed in the “PFOS/PFOA” section of this data quality assessment.

Four equipment rinsate samples (two for soil and two for groundwater) were collected and analyzed for PFOS/PFOA. All results were non-detect for the equipment blank samples. Field blank sample FB-01 was collected from the deionized water source and analyzed for PFOS/PFOA. PFHxS and PFOA were detected at low estimated concentrations in the field blank; however, no qualification was required due to sample results above blank concentrations or non-detects. Note that decontamination procedures were followed in the field, including washing with laboratory grade, non-phosphate detergent; rinsing with potable water; final rinsing with deionized, analyte free water; and air drying. For these reasons, SI data quality was not impacted as a result of the SI COCs being detected in the field blank.

PFOS/PFOA

Some PFOS/PFOA compounds were qualified as estimated due to minor QC outliers. Two PFNA results were qualified as estimated (J) due to surrogate recovery results outside control limits. Fifty PFOS/PFOA results were qualified as estimated (J) due to internal standard outliers. PFOS in sample POR08-SB1-01 was qualified as estimated (J) due to MS/MSD recovery outliers. One PFHxS result for sample POR02-SB1-01D was qualified as non-detect due to continuing calibration blank contamination. The PFOS result for sample MW-POR02-01-01 was qualified as estimated due to results reported above the calibration range after maximum dilution. No other QC outliers resulted in qualification of the data during the data validation process.

Except as noted above, data produced for this investigation demonstrate that it can withstand scientific scrutiny; are appropriate for its intended purpose; are technically defensible; and are of known and acceptable sensitivity, precision, and accuracy. Data integrity has been documented through proper implementation of QA and QC measures. The environmental information presented has an established confidence that allows utilization for the project objectives and provides data for future needs.

5.2 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) was managed in compliance with the SI WP (Leidos 2018). Two drums of non-hazardous soil IDW and one drum of non-hazardous water IDW were transported to a designated drum staging area located onsite. Soil and water samples were collected and analyzed for toxicity characteristic leaching procedure (TCLP) VOCs. In addition, PFOS/PFOA results from soil and water samples and field PID screening results during the SI in conjunction with the historical site process knowledge will be used for IDW waste characterization. Leidos is currently coordinating with Veolia Environmental Services for the removal of IDW drums for offsite disposal.

In addition, per the Base requirements, IDW groundwater drawn around Building 255 was segregated to a separate 5-gal bucket to be disposed of as an F-listed hazardous waste due to its past history under the ERP. Due to the 90-day hazardous waste accumulation limit for the F-listed waste, it was shipped to a permitted treatment/storage/disposal facility off Base on July 24, 2018, under Uniform Hazardous Waste Manifest 011622068FLE.

5.3 PRL 2: NEW FIRE DEPARTMENT – BUILDING 180

A total of two soil borings and two monitoring wells were installed and sampled at PRL 2 (Table 3), as described below.

5.3.1 Sampling Activities

5.3.1.1 Soil

A total of two soil borings were advanced at PRL 2 on May 23 and 25, 2018. POR02-SB1 was advanced in Bay 7 of Building 180 and POR02-SB2 was advanced in a concrete area north of Building 180 (Figure 3). The soil borings were advanced using a DPT drill rig. Borings were advanced to a total depth of 10 ft BGS at both borings. Soil lithology descriptions were logged on the soil boring logs (Appendix A). A total of five soil samples (including one field duplicate) were collected and analyzed for PFOS/PFOA compounds.

5.3.1.2 Groundwater

MW-POR02-01 was installed south of Building 180 on May 25, 2018 (Figure 6). MW-POR02-02 was installed downgradient from the PRL in the grassy area west of Building 180 on May 25, 2018. Well construction details are shown in Table 4. The well construction diagrams are included in Appendix A.

MW-POR02-01 and MW-POR02-02 were developed on May 29, 2018, and sampled on May 31, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater samples MW-POR02-01-01 and MW-POR02-02-01 were collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Both wells were surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.3.2 Analytical Results

5.3.2.1 Soil

Five soil samples (including a field duplicate) were collected and analyzed from PRL 2, as described in Section 5.3.1. Both surface soil samples showed detections above the laboratory detection limit for PFOS, PFOA, PFBS, PFHxS, and PFHpA (only PFOS was detected in the duplicate sample). PFNA was not detected. No screening criteria exist for PFHxS or PFHpA. PFBS, PFOS, and PFOA did not exceed the soil screening criteria in any of the surface soil samples.

PFHpA, PFHxS, PFOS, and PFOA were detected in both subsurface soil samples. In addition, PFBS was also detected in POR02-SB2-02. PFNA was not detected in either sample. No screening criteria exist for PFHxS or PFHpA. PFBS, PFOS, and PFOA did not exceed the soil screening criteria in either subsurface soil samples. Soil analytical results for PRL 2 are presented in Table 7 and shown in Figure 3.

5.3.2.2 Groundwater

Two groundwater samples were collected from MW-POR02-01 and MW-POR02-02 and analyzed as described in Section 5.3.1. All six PFOS/PFOA compounds were detected above laboratory detection limits in both groundwater samples. In MW-POR02-01, PFOS and PFOA exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at concentrations of 42,000 and 970 ng/L, respectively. The combined PFOS and PFOA concentration at MW-POR02-01 is 42,970 ng/L. This location had the highest PFOS and combined PFOS and PFOA concentrations at Portland ANGB. In MW-POR02-02, PFOS and PFOA exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at concentrations of 2,100 and 560 ng/L, respectively. The combined PFOS and PFOA concentration at MW-POR02-02 is 2,660 ng/L. PFBS was below the EPA RSL at both sample locations. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 2 are presented in Table 8 and shown in Figure 6.

5.4 PRL 3: HANGAR 250

A total of two soil borings were installed and sampled at PRL 3 (Table 3), as described below. PRL 3 is co-located with PRL 4 (Hangar 255). The new monitoring well installed at PRL 4 (MW-REN04-01) was used to assess the groundwater at PRL 3.

5.4.1 Sampling Activities

5.4.1.1 Soil

A total of two soil borings were advanced at PRL 3 on May 22, 2018. POR03-SB1 was advanced in a grassy area west of Hangar 250 and POR03-SB2 was advanced in a grassy area from the northwestern corner of Hangar 250 (Figure 4). The soil borings were advanced using a DPT drill rig. Borings were advanced to a total depth of 10 ft BGS at each location. Soil lithology descriptions were logged on the soil boring logs (Appendix A). A total of five soil samples (including one field duplicate) were collected and analyzed for PFOS/PFOA compounds.

5.4.1.2 Groundwater

MW-POR04-01 was drilled in the asphalt parking lot downgradient from PRLs 3 and 4 on May 25, 2018 (Figure 6). Well construction details are shown in Table 4. The well construction diagram is included in Appendix A.

MW-POR04-01 was developed on May 29, 2018, and sampled on May 31, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater sample MW-POR04-01-01 was collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Well MW-POR04-01 was surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.4.2 Analytical Results

5.4.2.1 Soil

Five soil samples (including a field duplicate) were collected and analyzed from PRL 3, as described in Section 5.4.1. Only PFOS and PFHxS were detected in the two surface soil samples. No screening criteria exist for PFHxS, PFHpA, and PFNA. Neither PFOS detections exceeded the soil screening criteria.

None of the six PFOS/PFOA compounds were detected in the primary or duplicate subsurface soil sample at POR03-SB1. The only detected compounds in the subsurface soil sample at POR03-SB2 were PFOS and PFHxS. No screening criteria exist for PFHxS. The PFOS concentration in POR03-SB2 did not exceed the soil screening criteria. PRL 3 soil analytical results are presented in Table 7 and shown in Figure 4.

5.4.2.2 Groundwater

One groundwater sample was collected downgradient from PRLs 3 and 4 (MW-POR04-01) and analyzed as described in Section 5.4.1. All six PFOS/PFOA compounds were detected above laboratory detection limits. PFOS exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at a concentration of 220 ng/L. The combined PFOS and PFOA concentration at this location (273 ng/L) also exceeded the EPA drinking water HA. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 3 are presented in Table 8 and shown in Figure 6.

5.5 PRL 4: HANGAR 255

A total of three soil borings and one monitoring well were installed and sampled at PRL 4 (Table 3), as described below. PRL 4 is co-located with PRL 3 (Hangar 250).

5.5.1 Sampling Activities

5.5.1.1 Soil

A total of three soil borings were installed on May 22 and 23, 2018, in the PRL 4 area. POR04-SB1 was installed in an asphalt area adjacent to an oil/water separator (OWS) southwest of the hangar, POR04-SB2 was installed in an asphalt area west of Hangar 255, and POR04-SB3 was installed in an asphalt area north of the hangar (Figure 4). The soil borings were advanced using a DPT drill rig. Borings were advanced to total depths ranging from 10 ft BGS (POR04-SB3) to 15 ft BGS (POR04-SB1 and POR04-SB2). Soil lithology descriptions were logged on the soil boring logs (Appendix A). A total of six soil samples were collected and analyzed for PFOS/PFOA compounds.

5.5.1.2 Groundwater

MW-POR04-01 was drilled in the asphalt parking lot downgradient from the PRL on May 25, 2018 (Figure 6). Well construction details are shown in Table 4. The well construction diagram is included in Appendix A.

MW-POR04-01 was developed on May 29, 2018, and sampled on May 31, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater sample MW-POR04-01-01 was collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Well MW-POR04-01 was surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.5.2 Analytical Results

5.5.2.1 Soil

Six soil samples from POR04-SB1, POR04-SB2, and POR04-SB3 were collected and analyzed as described in Section 5.5.1. All six PFOS/PFOA compounds (except PFNA) were detected above laboratory detection limits in surface soil sample POR04-SB1. None of the PFOS/PFOA compounds were detected in the surface soil at POR04-SB2 or POR04-SB3. No screening criteria exist for PFHxS, PFHpA, and PFNA. The concentrations of PFOS, PFOA, or PFBS in POR04-SB1 did not exceed the soil screening criteria.

All six PFOS/PFOA compounds (except PFNA) were detected above laboratory detection limits in the subsurface soil sample at POR04-SB1. None of the PFOS/PFOA compounds were detected in the subsurface soil at POR04-SB2 or POR04-SB3. No screening criteria exist for PFHxS, PFHpA, and PFNA. None of the concentrations of PFOS, PFOA, or PFBS in POR04-SB1 exceeded the soil screening criteria. PRL 4 soil analytical results are presented in Table 7 and shown in Figure 4.

5.5.2.2 Groundwater

One groundwater sample was collected from MW-POR04-01 located downgradient from the PRL (and analyzed as described in Section 5.5.1. All six PFOS/PFOA compounds were detected above laboratory detection limits, and PFOS exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at a concentration of 220 ng/L. The combined PFOS and PFOA concentration at this location is 273 ng/L. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 4 are presented in Table 8 and shown in Figure 6.

5.6 PRL 5: OLD FIRE DEPARTMENT AND SWALE – BUILDING 290

A total of seven soil samples (including one field duplicate) from three soil borings, one groundwater sample from one monitoring well, and one sediment sample were collected to evaluate PRL 5 (Table 3), as described below.

5.6.1 Sampling Activities

5.6.1.1 Soil

A total of three soil borings were advanced at PRL 5 on May 22, 2018. POR05-SB1 was installed in an asphalt area north of Building 290, POR05-SB2 was installed in a grassy area west of Building 290 (Figure 3), and POR05-SB3 was installed in the drainage swale northwest of Building 290. The soil borings were advanced using a DPT drill rig. Borings were advanced to total depths ranging from 10 ft BGS (POR05-SB1 and POR05-SB3) to 15 ft BGS (POR05-SB2). Soil lithology descriptions were logged on the soil boring logs (Appendix A). A total of seven soil samples (including one field duplicate) were collected and analyzed for PFOS/PFOA compounds.

5.6.1.2 Groundwater

MW-POR05-01 was installed in the drainage swale northwest of Building 290 on May 25, 2018 (Figure 6). Well construction details are shown in Table 4. The well construction diagram is included in Appendix A.

MW-POR05-01 was developed on May 25, 2018, and sampled on May 29, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater sample MW-POR05-01-01 was collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Well MW-POR05-01 was surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.6.1.3 Surface water

A surface water sample was planned to be collected from the drainage swale northwest of Building 290 (Figure 6); however, no surface water was present during the SI sampling event.

5.6.1.4 Sediment

Sediment sample POR05-SD1-01 was collected from the drainage swale northwest of Building 290 on May 24, 2018 (Figure 3). The sample was analyzed for PFOS/PFOA compounds.

5.6.2 Analytical Results

5.6.2.1 Soil

Seven soil samples from POR05-SB1, POR05-SB2, and POR05-SB3 were collected and analyzed as described in Section 5.6.1. All six PFOS/PFOA compounds were detected above laboratory detection limits in surface soil samples POR05-SB1 (primary and duplicate) and POR05-SB3. PFOS, PFOA, PFHxS were detected above laboratory detection limits at POR05-SB2. No screening criteria exist for PFHxS, PFHpA, and PFNA. None of the concentrations of PFOS, PFOA, or PFBS exceeded the soil screening criteria.

In the subsurface soil sample from POR05-SB1, PFOS, PFOA, PFHxS, PFBS, and PFHpA were detected above laboratory detection limits. PFNA was not detected. PFHxS and PFOS were detected above laboratory detection limits in subsurface soil from POR05-SB2 and POR05-SB3. No screening criteria exist for PFHxS and PFHpA. None of the concentrations of PFOS, PFOA, or PFBS exceeded the soil screening criteria. PRL 5 soil analytical results are presented in Table 7 and shown in Figure 3.

5.6.2.2 Groundwater

One groundwater sample was collected from MW-POR05-01 and analyzed as described in Section 5.6.1. All six PFOS/PFOA compounds were detected above laboratory detection limits in the groundwater sample. PFOS exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at a concentration of 2,300 ng/L. The combined PFOS and PFOA concentration at MW-POR05-01 is 2,340 ng/L. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 5 are presented in Table 8 and shown in Figure 6.

5.6.2.3 Sediment

One sediment sample was collected from POR05-SD1 and analyzed as described in Section 5.6.1. All six PFOS/PFOA compounds were detected above laboratory detection limits. PFOS, PFOA, and PFBS concentrations did not exceed the soil screening criteria. No screening criteria exist for PFNA, PFHxS, and PFHpA. Sediment analytical results for POR05-SD1 are presented in Table 7 and shown in Figure 3.

5.7 PRL 6: HANGAR 310

A total of two soil borings and one monitoring well were installed and sampled at PRL 6 (Table 3), as described below.

5.7.1 Sampling Activities

5.7.1.1 Soil

A total of two soil borings were advanced at PRL 6 on May 22, 2018. POR06-SB1 and POR06-SB2 were installed in grassy areas northeast and northwest of the hangar (Figure 3). The soil borings were advanced using a DPT drill rig. Borings were advanced to total depths of 5 ft BGS. Soil lithology descriptions were logged on the soil boring logs (Appendix A). A total of four soil samples were collected and analyzed for PFOS/PFOA compounds.

5.7.1.2 Groundwater

MW-POR06-01 was installed in the grassy area northwest of Hangar 310 on May 24, 2018 (Figure 6). Well construction details are shown in Table 4. The well construction diagram is included in Appendix A.

MW-POR06-01 was developed on May 25, 2018 and sampled on May 29, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater sample MW-POR06-01-01 was collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Well MW-POR06-01 was surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.7.2 Analytical Results

5.7.2.1 Soil

Four soil samples from POR06-SB1 and POR06-SB2 were collected and analyzed as described in Section 5.7.1. PFHxS and PFOS were detected above laboratory detection limits in both surface soil samples. No screening criteria exist for PFHxS. Neither PFOS concentrations exceeded the soil screening criteria.

PFHxS and PFOS were also detected in both subsurface soil samples. No screening criteria exist for PFHxS. Neither PFOS concentrations exceeded the soil screening criteria. PRL 6 soil analytical results are presented in Table 7 and shown in Figure 3.

5.7.2.2 Groundwater

One groundwater sample was collected from MW-POR06-01 and analyzed as described in Section 5.7.1. All six PFOS/PFOA compounds were detected above laboratory detection limits in the groundwater sample. PFOS exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at a concentration of 690 ng/L. The combined PFOS and PFOA concentration at MW-POR06-01 is 720 ng/L. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 6 are presented in Table 8 and shown in Figure 6.

5.8 PRL 7: HANGAR 380

A total of four soil samples from two borings, one groundwater sample from one monitoring well, one surface water, and one sediment sample were collected to evaluate PRL 7 (Table 3), as described below.

5.8.1 Sampling Activities

5.8.1.1 Soil

A total of two soil borings were installed at PRL 7 on May 22, 2018. POR07-SB1 and POR07-SB2 were installed in grassy areas northeast and southeast of the hangar, respectively (Figure 5). POR07-SB2 is adjacent to the mechanical room. The soil borings were advanced using a DPT drill rig. Borings were advanced to total depths of 10 ft BGS. Soil lithology descriptions were logged on the soil boring logs (Appendix A). A total of four soil samples were collected and analyzed for PFOS/PFOA compounds.

5.8.1.2 Groundwater

MW-POR07-01 was installed downgradient from the PRL in the grassy area northwest of Hangar 380 and adjacent to the Base boundary on May 24, 2018 (Figure 6). Well construction details are shown in Table 4. The well construction diagram is included in Appendix A.

MW-POR07-01 was developed on May 25, 2018, and sampled on May 29, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater sample MW-POR07-01-01 was collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Well MW-POR07-01 was surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.8.1.3 Surface water

Surface water sample POR07-SW1 was collected on May 29, 2018, from the catch basin located outside the mechanical room on the southeastern side of the Hangar 380. The sample location is shown in Figure 6. POR07-SW1 was analyzed for PFOS/PFOA.

5.8.1.4 Sediment

Sediment sample POR07-SD1 was collected on May 29, 2018, from the catch basin located outside the mechanical room on the southeastern side of the Hangar 380. The sample location is shown in Figure 5. POR07-SD1 was analyzed for PFOS/PFOA.

5.8.2 Analytical Results

5.8.2.1 Soil

Four soil samples from POR07-SB1 and POR07-SB2 were collected and analyzed as described in Section 5.8.1. PFHxS, PFNA, PFOS, and PFOA were detected above laboratory detection limits in surface soil sample POR07-SB1. PFBS, PFHpA, and PFHxS were detected above laboratory detection limits in surface soil sample POR07-SB2. No screening criteria exist for PFHxS, PFHpA, and PFNA. None of the concentrations of PFOS, PFOA, or PFBS exceeded the soil screening criteria.

PFHxS and PFOS were detected above the laboratory detection limits in the subsurface soil from POR07-SB1. PFOS, PFOA, PFBS, PFHpA, and PFHxS were detected above laboratory detection limits in POR07-SB2 (PFNA was not detected). No screening criteria exist for PFNA, PFHxS and PFHpA. None of the concentrations of PFOS, PFOA, or PFBS exceeded the soil screening criteria. PRL 7 soil analytical results are presented in Table 7 and shown in Figure 5.

5.8.2.2 Groundwater

One groundwater sample was collected from MW-POR07-01 and analyzed as described in Section 5.8.1. All six PFOS/PFOA compounds were detected above laboratory detection limits in the groundwater sample. PFOS exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at a concentration of 310 ng/L. The combined PFOS and PFOA concentration at MW-POR07-01 is 355 ng/L. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 7 are presented in Table 8 and shown in Figure 6.

5.8.2.3 Surface water

One surface water sample was collected from POR07-SW1 and analyzed as described in Section 5.8.1. All six PFOS/PFOA compounds were detected above laboratory detection limits. PFOS and PFOA exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at concentrations of 3,000 and 360 ng/L, respectively. The combined PFOS and PFOA concentration at POR07-SW1 is 3,360 ng/L. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Surface water analytical results for POR07-SW1 are presented in Table 8 and shown in Figure 6.

5.8.2.4 Sediment

One sediment sample was collected from POR07-SD1 and analyzed as described in Section 5.8.1. All six PFOS/PFOA compounds were detected above laboratory detection limits. No screening criteria exist for PFNA, PFHxS, and PFHpA. PFOS exceeded the soil screening criteria of 1,260 µg/kg at a concentration

of 1,800 µg/kg. PFOA and PFBS concentrations did not exceed the soil screening criteria. Sediment analytical results for POR07-SD1 are presented in Table 7 and shown in Figure 5.

5.9 PRL 8: HANGAR 375

A total of two soil borings and one monitoring well were installed and sampled at PRL 8 (Table 3), as described below.

5.9.1 Sampling Activities

5.9.1.1 Soil

A total of two soil borings were advanced at PRL 8 on May 24, 2018. POR08-SB1 and POR08-SB2 were installed in grassy areas northeast and northwest of the hangar (Figure 5). The soil borings were advanced using a DPT drill rig. Borings were advanced to total depths of 10 ft BGS. Soil lithology descriptions were logged on the soil boring logs (Appendix A). A total of five soil samples (including one field duplicate) were collected and analyzed for PFOS/PFOA compounds.

5.9.1.2 Groundwater

MW-POR08-01 was installed downgradient from the PRL in the grassy area northwest of Hangar 375 located outside the Base boundary on May 24, 2018 (Figure 6). Well construction details are shown in Table 4. The well construction diagram is included in Appendix A.

MW-POR08-01 was developed on May 29, 2018, and sampled on May 31, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater sample MW-POR08-01-01 was collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Well MW-POR08-01 was surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.9.2 Analytical Results

5.9.2.1 Soil

Five soil samples from POR08-SB1 and POR08-SB2 were collected and analyzed as described in Section 5.9.1. PFOS was detected above laboratory detection limits in both surface soil samples. PFHxS was also detected in surface soil at POR08-SB2. No screening criteria exist for PFHxS. Neither PFOS concentrations exceeded the soil screening criteria.

PFOS was detected above laboratory detection limits in both subsurface soil samples at POR08-SB1 (primary and duplicate) and POR08-SB2. PFHxS was also detected in subsurface soil at POR08-SB2. No screening criteria exist for PFHxS. None of the PFOS concentrations exceeded the soil screening criteria. PRL 8 soil analytical results are presented in Table 7 and shown in Figure 5.

5.9.2.2 Groundwater

One groundwater sample was collected from MW-POR08-01 and analyzed as described in Section 5.9.1. All six PFOS/PFOA compounds were detected above laboratory detection limits in the groundwater sample. PFOS and PFOA exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at concentrations of 370 and 180 ng/L, respectively. The combined PFOS and PFOA concentration at MW-POR08-01 is

550 ng/L. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 8 are presented in Table 8 and shown in Figure 6.

5.10 PRL 10: PONDS/STORMWATER RETENTION BASINS

A total of two soil samples from one boring, one groundwater sample from one monitoring well, five surface water samples, and five sediment samples were collected to evaluate PRL 10 (Table 3), as described below.

5.10.1 Sampling Activities

5.10.1.1 Soil

During the installation of the groundwater monitoring well (MW-POR10-01) on May 23, 2018, two soil samples (MWPOR10-SB1-01, MWPOR10-SB1-02) were collected from the boring advanced for the monitoring well. The two samples were analyzed for PFOS/PFOA compounds.

5.10.1.2 Groundwater

MW-POR10-01 was installed south of the retention basins in the grassy area adjacent to the Base boundary on May 23, 2018 (Figure 6). Well construction details are shown in Table 4. The well construction diagram is included in Appendix A.

MW-POR10-01 was developed on May 25, 2018, and sampled on May 31, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater sample MW-POR10-01-01 was collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Well MW-POR10-01 was surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.10.1.3 Surface water

Surface water samples POR10-SW1 (northern retention basin), POR10-SW2 (southern retention basin), and POR10-SW3 (southern retention basin) located near the Base boundary were collected on May 23, 2018, in the locations shown in Figure 6. POR10-SW4 was collected on May 29, 2018, and POR10-SW5 was collected on May 31, 2018 from the drainage ditch network that discharges to the retention basins. Water quality parameters were measured as shown in Table 6. The samples were analyzed for PFOS/PFOA compounds.

5.10.1.4 Sediment

Sediment samples POR10-SD1 (northern retention basin), POR10-SD2 (southern retention basin), and POR10-SD3 (southern retention basin) were collected on May 23, 2018, in the locations shown in Figure 5. POR10-SD4 was collected on May 29, 2018, and POR10-SD5 was collected on May 31, 2018 from the drainage ditch network that discharges to the retention basins. The samples were analyzed for PFOS/PFOA compounds.

5.10.2 Analytical Results

5.10.2.1 Soil

Two soil samples from MW-POR10-SB1 were collected and analyzed as described in Section 5.10.1. PFBS, PFHxS, PFOS, and PFOA were detected above laboratory detection limits in the surface soil sample. No screening criteria exist for PFHxS, PFHpA, and PFNA. The concentrations of PFOS, PFOA, and PFBS did not exceed the soil screening criteria.

PFHxS and PFOS were detected above laboratory detection limits in the subsurface soil sample. No screening criteria exist for PFHxS. The PFOS concentration did not exceed the soil screening criteria. PRL 10 soil analytical results are presented in Table 7 and shown in Figure 5.

5.10.2.2 Groundwater

One groundwater sample was collected from MW-POR10-01 and analyzed as described in Section 5.10.1. All six PFOS/PFOA compounds were detected above laboratory detection limits in the groundwater sample. PFOS exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at a concentration of 160 ng/L. The combined PFOS and PFOA concentration at MW-POR10-01 is 172 ng/L. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 10 are presented in Table 8 and shown in Figure 6.

5.10.2.3 Surface water

Surface water samples POR10-SW1 through POR10-SW5 were collected and analyzed as described in Section 5.10.1. In each of the five samples, all six PFOS/PFOA compounds were detected at concentrations exceeding the laboratory detection limit. PFOS was detected at concentrations exceeding the EPA drinking water HA screening level of 70 ng/L in all five surface water samples. PFOA exceeded the EPA drinking water HA screening level of 70 ng/L only at POR10-SW4. The combined PFOS and PFOA concentrations ranged from 1,052 ng/L (POR10-SW2) to 1,744 ng/L (POR10-SW3), exceeding the EPA HA screening criteria. PFBS concentrations in all five samples were below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. PRL 10 surface water analytical results are presented in Table 8 and shown in Figure 6.

5.10.2.4 Sediment

Sediment samples POR10-SD1 through POR10-SD5 were collected and analyzed as described in Section 5.10.1. PFBS was detected at concentrations exceeding the laboratory detection limit at POR10-SD1, POR10-SD3, and POR10-SD4. PFHxS, PFOS, and PFOA were detected at concentrations exceeding the laboratory detection limit in all five sediment samples. No screening criteria exist for PFHxS. PFOS, PFOA, and PFBS concentrations did not exceed the soil screening criteria. PRL 10 sediment analytical results are presented in Table 7 and shown in Figure 5.

5.11 PRL 11: FORMER IRP SITE 7 BURN PIT

A total of three soil borings and one monitoring well were installed and sampled at PRL 11 (Table 3), as described below.

5.11.1 Sampling Activities

5.11.1.1 Soil

A total of three soil borings were advanced at PRL 11 on May 23, 2018. POR11-SB1 was installed in a gravel area at the center of the approximated burn pit area. POR11-SB2 and POR11-SB3 were installed along the western and northern boundaries of the burn pit area, respectively (Figure 4). The soil borings were advanced using a DPT drill rig. Borings were advanced to total depths ranging from 13 ft BGS (POR11-SB3) to 15 ft BGS (POR11-SB1, POR11-SB2). Soil lithology descriptions were logged on the soil boring logs (Appendix A). A total of seven soil samples (including one field duplicate) were collected and analyzed for PFOS/PFOA compounds.

5.11.1.2 Groundwater

MW-POR11-01 was installed in a gravel area in the center of the approximated burn pit area located outside the Base boundary on May 23, 2018 (Figure 6). Well construction details are shown in Table 4.

MW-POR11-01 was developed on May 29, 2018, and sampled on May 31, 2018. Water levels are shown in Table 5, and water quality parameters are shown in Table 6. Groundwater sample MW-POR11-01-01 was collected and analyzed for PFOS/PFOA compounds. The Groundwater Micro Purge Sheet and Groundwater Micro Purge Log are included in Appendix B.

Well MW-POR11-01 was surveyed by a licensed surveyor, and the well survey report is included in Appendix C.

5.11.2 Analytical Results

5.11.2.1 Soil

Seven soil samples from POR11-SB1, POR11-SB2, and POR11-SB3 were collected and analyzed as described in Section 5.11.1. PFHpA, PFHxS, PFOS, and PFOA were detected above laboratory detection limits in the surface soil sample from POR11-SB1. All six PFOS/PFOA compounds were detected above laboratory detection limits in the surface soil sample from POR11-SB2 (except PFNA) and POR11-SB3. No screening criteria exist for PFHxS, PFHpA, and PFNA. None of the concentrations of PFOS, PFOA, or PFBS exceeded the soil screening criteria.

In subsurface soil sample POR11-SB1, PFOS/PFOA compounds were detected above laboratory detection limits. In the subsurface soil samples from POR11-SB2 and POR11-SB3, PFOS, PFOA, PFHxS, PFBS, and PFHpA were detected above laboratory detection limits; PFNA was not detected. No screening criteria exist for PFHxS, PFHpA, and PFNA. None of the concentrations of PFOS, PFOA, or PFBS exceeded the soil screening criteria. PRL 11 soil analytical results are presented in Table 7 and shown in Figure 4.

5.11.2.2 Groundwater

One groundwater sample was collected from MW-POR11-01 and analyzed as described in Section 5.11.1. All six PFOS/PFOA compounds were detected above laboratory detection limits in the groundwater sample. PFOS and PFOA exceeded the 70-ng/L EPA drinking water HA (EPA 2016a) at concentrations of 7,800 and 24,000 ng/L, respectively. This location had the highest PFOA concentration at Portland ANGB. The combined PFOS and PFOA concentration at MW-POR11-01 is 31,800 ng/L. PFBS was below the EPA RSL. No screening criteria exist for PFHxS, PFHpA, and PFNA. Groundwater analytical results for PRL 11 are presented in Table 8 and shown in Figure 6.

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6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

This section presents the SI conclusions and recommendations for each PRL. The recommended DQOs are based on data collected by Leidos during this SI and an evaluation of the analytical results compared to applicable screening criteria.

6.1.1 PRL 2: New Fire Department – Building 180

Although PFOS/PFOA compounds were detected in PRL 2 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 2.

Evaluation of groundwater data compared to screening criteria indicates an exceedance of the EPA HA (70 ng/L) in MW-POR02-01 and MW-POR02-02 for PFOS and PFOA (combined), with results of 42,970 and 2,660 ng/L, respectively. MW-POR02-01 had the highest PFOS and combined PFOS and PFOA concentrations at Portland ANGB.

Based on the SI results, the following DQOs are recommended for PRL 2:

- Additional surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances; and
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional new monitoring wells located both upgradient of and downgradient from PRL 2.

6.1.2 PRL 3: Hangar 250

Although PFOS/PFOA compounds were detected in PRL 3 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 3.

PRL 3 is co-located with PRL 4. The monitoring well installed at PRL 4 was used to evaluate the groundwater at PRL 3. Evaluation of groundwater data compared to screening criteria indicates an exceedance of the EPA HA (70 ng/L) in MW-POR04-01 for PFOS and PFOA (combined), with a result of 273 ng/L.

Based on the SI results, the following DQOs are recommended for PRL 3:

- Additional surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances; and
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional new monitoring wells located both upgradient of and downgradient from PRL 3.

6.1.3 PRL 4: Hangar 255

Although PFOS/PFOA compounds were detected in PRL 4 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 4.

PRL 4 is co-located with PRL 3. Evaluation of groundwater data compared to screening criteria indicates an exceedance of the EPA HA (70 ng/L) in MW-POR04-01 for PFOS and PFOA (combined), with a result of 273 ng/L.

Based on the SI results, the following DQOs are recommended for PRL 4:

- Additional surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances; and
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional new monitoring wells located both upgradient of and downgradient from PRL 4.

6.1.4 PRL 5: Old Fire Department and Swale – Building 290

Although PFOS/PFOA compounds were detected in PRL 5 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 5.

Evaluation of groundwater data compared to screening criteria indicates an exceedance of the EPA HA (70 ng/L) in MW-POR05-01 for PFOS and PFOA (combined), with a result of 2,340 ng/L.

In addition, sediment results from within the drainage swale indicated all six PFOS/PFOA compounds were detected. Evaluation of sediment analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for sediment at PRL 5.

Based on the SI results, the following DQOs are recommended for PRL 5:

- Additional surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances;
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional monitoring wells located both upgradient of and downgradient from PRL 5;
- Additional investigation to confirm the concentrations of PFOS/PFOA in sediment within the drainage swale to further evaluate the PFOS/PFOA impacts; and
- Surface water investigation within the drainage swale to evaluate PFOS/PFOA impacts.

6.1.5 PRL 6: Hangar 310

Although PFOS/PFOA compounds were detected in PRL 6 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 6.

Evaluation of groundwater data compared to screening criteria indicates exceedances of the EPA HA (70 ng/L) in MW-POR06-01 for PFOS and PFOA (combined), with a result of 720 ng/L.

Based on the SI results, the following DQOs are recommended for PRL 6:

- Additional surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances; and
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional monitoring wells located both upgradient of and downgradient from PRL 6.

6.1.6 PRL 7: Hangar 380

Although PFOS/PFOA compounds were detected in PRL 7 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 7. Sediment sample results from the catch basin located outside mechanical room on the southeastern side of the Hangar 380 indicated all six PFOS/PFOA compounds were detected. Evaluation of sediment analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOA or PFBS. However, the PFOS concentration in the sediment sample (1,800 µg/kg) exceeded the residential risk-based screening level for PFOS.

Evaluation of groundwater data compared to screening criteria indicates exceedances of the EPA HA (70 ng/L) in MW-POR07-01 for PFOS and PFOA (combined), with a result of 355 ng/L. Evaluation of surface water data compared to screening criteria indicates exceedances of the EPA HA (70 ng/L) in POR07-SW1 for PFOS and PFOA (combined), with a result of 3,360 ng/L.

Based on the SI results, the following DQOs are recommended for PRL 7:

- Additional surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances;
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional new monitoring wells located both upgradient of and downgradient from PRL 7; and
- Additional investigation to confirm the concentrations of PFOS/PFOA in surface water and sediment, which should include additional sampling of surface water and sediment within the catch basin at Hangar 380 as well as upgradient of and downgradient from PRL 7 to further evaluate the PFOS/PFOA impacts.

6.1.7 PRL 8: Hangar 375

Although PFOS/PFOA compounds were detected in PRL 8 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 8.

Evaluation of groundwater data compared to screening criteria indicates an exceedance of the EPA HA (70 ng/L) in MW-POR08-01 for PFOS and PFOA (combined), with a result of 550 ng/L.

Based on the SI results, the following DQOs are recommended for PRL 8:

- Additional surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances; and
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional new monitoring wells located both upgradient of and downgradient from PRL 8.

6.1.8 PRL 10: Ponds/Stormwater Retention Basins

Although PFOS/PFOA compounds were detected in PRL 10 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 10. Evaluation of results from the five sediment samples indicates PFOS, PFOA, or PFBS concentrations did not exceed the soil screening criteria.

Evaluation of groundwater data compared to screening criteria indicates an exceedance of the EPA HA (70 ng/L) in MW-POR10-01 for PFOS and PFOA (combined), with a result of 172 ng/L. Evaluation of surface water data compared to screening criteria indicates an exceedance of the EPA HA (70 ng/L) in all five surface water samples for PFOS and PFOA (combined), with results ranging from 1,052 to 1,744 ng/L.

Based on the SI results, the following DQOs are recommended for PRL 10:

- Surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances.
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional new monitoring wells located both upgradient of and downgradient from PRL 10.
- Additional investigation to confirm the concentrations of PFOS/PFOA in surface water and sediment, which should include additional sampling of surface water and sediment to further evaluate the PFOS/PFOA impacts. Additional surface water and sediment samples should be collected from the drainage ditch network, potential upgradient sources, and downstream discharge locations from the retention basins located off Base.

6.1.9 PRL 11: Former IRP Site 7 Burn Pit

Although PFOS/PFOA compounds were detected in PRL 11 soil samples, evaluation of soil analytical data compared to soil screening criteria indicates there are no calculated residential risk-based screening level exceedances for PFOS, PFOA, or PFBS for soil in PRL 11.

Evaluation of groundwater data compared to screening criteria indicates an exceedance of the EPA HA (70 ng/L) in MW-POR11-01 for PFOS and PFOA (combined), with a result of 31,800 ng/L. This location had the highest PFOA concentration at Portland ANGB.

Based on the SI results, the following DQOs are recommended for PRL 11:

- Additional surface and subsurface soil samples to determine if a previously undetected source area exists that is contributing to the groundwater exceedances; and
- Additional investigation to determine the nature and extent of PFOS/PFOA in groundwater (both laterally and vertically), through sampling of additional new monitoring wells located both upgradient of and downgradient from PRL 11.

6.1.10 PFOS/PFOA Contamination Near Installation Boundary

Samples from four monitoring wells (MW-POR07-01, MW-POR08-01, MW-POR10-01, MW-POR11-01) and three surface water samples (POR10-SW1, POR10-SW2, POR10-SW3) were collected to evaluate the PFOS/PFOA contamination near the Installation boundary (Figure 6). MW-POR08-01 and MW-POR11-01 are associated with PRLs located immediately outside and adjacent to the Base boundary and thus were included in assessing migration of PFOS/PFOA compounds offsite. All six PFOS/PFOA compounds were detected in the groundwater samples collected adjacent (both onsite and offsite) to the Installation boundary. All six PFOS/PFOA compounds were also detected in the surface water samples collected within the Installation boundary. The screening results indicate the consistent presence of PFOS and PFOA at concentrations exceeding the 70-ng/L EPA drinking water HA (EPA 2016a). The second highest maximum combined concentration of PFOS and PFOA occurred in the well at PRL 11 (MW-POR11-01), located upgradient of the PRLs within the Installation. PFBS concentrations did not exceed the RSL at any of the groundwater or surface water sample locations. No screening criteria exist for PFHxS, PFHpA, or PFNA. The SI results indicate PFOS/PFOA compounds have potentially migrated offsite given their presence and magnitude at the Installation boundary and at PRL 8 (located downgradient from the PRLs).

6.2 SUMMARY AND RECOMMENDATIONS

In summary, additional investigations are recommended for soil and groundwater at PRLs 2, 3, 4, 5, 6, 7, 8, 10, and 11 and surface water/sediment at PRLs 5, 7, and 10. The recommendations are summarized in Table 9 and described briefly below:

- Further investigation at all nine PRLs is necessary to determine the nature and extent of PFOS/PFOA contamination due to detectable levels at all PRLs.
- Develop an expanded conceptual site model that considers localized groundwater and surface water flow paths to select future sampling locations.

- Complete the delineation of nature and extent of PFAS as part of an Expanded SI or an RI that could consist of:
 - Additional soil and sediment sampling and analysis of an expanded list of PFAS constituents (in addition to the six UCMR3 constituents) to determine if significant source areas related to precursor substances are present. Precursor substances have been demonstrated to oxidize into PFOS and PFOA, and thus could provide a lingering source of these compounds to soil and groundwater.
 - Expanded groundwater sampling program (including analysis of an expanded list of PFAS constituents) to complete horizontal and vertical delineation of the PFOS/PFOA impacts. Further groundwater investigation at the Base boundary is recommended due to the presence of PFOS/PFOA in groundwater above their respective screening criteria.
 - The installation and sampling of upgradient and downgradient off-Base monitoring wells to better define the upgradient source of PFOS/PFOA as well as impacts of PFOS/PFOA that have migrated off Base.
 - The sampling of upgradient and downgradient off-Base surface water and sediment (including analysis of an expanded list of PFAS constituents) to better determine if there is an upgradient source of PFOS/PFOA, as well as impacts of PFOS/PFOA in surface water that have migrated off Base.
- Conduct preliminary site-specific risk assessment calculations in order to identify chemicals of potential concern (COPCs) in every medium and establish preliminary remedial goals for screening purposes.

DQOs are proposed based on the results of the SI and are presented in Table 9. In general, additional samples are required at each PRL in order to establish the nature and extent of PFOA/PFOS constituents for each applicable medium and determine if a complete receptor pathway exists. For soil, additional samples are proposed to determine if a source area exists and, if so, the vertical and horizontal extent for both the vadose and saturated zones. Additional surface water and sediment samples should be collected at PRLs 5, 7, and 10 to further evaluate PFOS/PFOA concentrations in surface water and sediment. As part of the conceptual site model, future investigations also will consider potential groundwater-to-surface water migration, including preferential migration of groundwater contaminants to surface water via subsurface utilities.

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TABLES

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Table 1. Preliminary Assessment Report Summary and Recommendations

No.	Potential AFFF PRL	Rationale	Recommendation
1	Base Supply – Building 170	The station has stored AFFF at this location for at least the past 10 years. According to Base personnel, no AFFF was spilled in the building.	NFA
2	New Fire Department – Building 180	Fire Department personnel indicated that minor spills occurred during filling the vehicles over the years from onsite containers and minor leaks from the equipment. In addition, at least three occurrences of AFFF being discharged to the stormwater sewer system were documented in the Annual Stormwater Reports.	Proceed to SI. Focus on groundwater.
3	Hangar 250	Minor leaks of AFFF have occurred in the mechanical room. No records of inadvertent releases in the hangar exist; however, if releases did occur, they may have potentially impacted the adjacent ramp.	Proceed to SI. Focus on soil and groundwater at the downgradient edges of the ramp based on surface drainage patterns.
4	Hangar 255	Minor leaks of AFFF have occurred in the mechanical room, with one inadvertent release in the main hangar. Most of the inadvertent release of AFFF likely was hosed off into the trench drain that connects to the sanitary sewer systems, with some of the AFFF making its way onto the ramp and then into the storm sewer system.	Proceed to SI. Focus on soil and groundwater at the downgradient edges of the ramp based on surface drainage patterns.
5	Old Fire Department and Swale – Building 290	Fire Department personnel indicated that minor spills occurred during filling the vehicles over the years from onsite containers and minor leaks from the equipment. In addition, at least one occurrence of AFFF being discharged to the stormwater sewer system is documented in the Annual Stormwater Reports. Reports of AFFF making its way to the drainage swale also have been documented.	Proceed to SI. Focus on soil, sediment, surface water, and groundwater.
6	Hangar 310	Minor leaks of AFFF have occurred in the mechanical room, with an inadvertent release in the main hangar. Most of the inadvertent release of AFFF likely was hosed off into the trench drain that connects to the sanitary sewer systems, with some of the AFFF making its way onto the ramp and then into the storm sewer system.	Proceed to SI. Focus on soil and groundwater at the downgradient edges of the ramp based on surface drainage patterns.
7	Hangar 380	AFFF was stored in fire suppression equipment in the mechanical room of Hangar 380. The fire suppression system's tanks are no longer present and were reportedly removed in 2005. No known discharges occurred in the room or in the main hangar; however, if releases did occur, they may have potentially impacted the adjacent ramp.	Proceed to SI. Focus on soil and groundwater at the downgradient edges of the ramp based on surface drainage patterns.
8	Hangar 375	Minor leaks of AFFF have occurred in the mechanical room, with an inadvertent release in the main hangar. Most of the inadvertent release of AFFF likely was hosed off into the trench drain that connects to the sanitary sewer systems, with some of the AFFF making its way onto the ramp and then into the storm sewer system.	Proceed to SI. Focus on soil and groundwater at the downgradient edges of the ramp based on surface drainage patterns.

Table 1. Preliminary Assessment Report Summary and Recommendations (continued)

No.	Potential AFFF PRL	Rationale	Recommendation
9	POL Storage – Building 431	This building formerly contained the AFFF system tank that provided fire protection for the fuel tanks.	Proceed to SI. Focus on soil and groundwater.
10	Ponds/Stormwater Retention Basins	These two ponds receive 95% of the Base's stormwater discharges. All of the previously aforementioned releases to the stormwater system eventually made their way to these two ponds.	Proceed to SI. Focus on sediment, surface water, and groundwater.

Note: During the September 2017 SI kickoff meeting site visit, stakeholder discussions resulted in deviation from the PA with respect to the PRLs being evaluated in the SI. It was determined that investigation at the POL Storage – Building 431 (PRL 9) would be replaced with investigation at the former IRP Site 7 Burn Pit (designated as PRL 11 in the SI WP).

AFFF = Aqueous film-forming foam.

IRP = Installation Restoration Program.

NFA = No further action.

PA = Preliminary assessment.

SI = Site investigation.

POL = Petroleum, oils, and lubricants.

PRL = Potential release point.

WP = Work Plan.

Table 2. PFOS/PFOA SI Screening Criteria

Parameter	Chemical Abstract Service Number	EPA RSL for Tap Water^a (ng/L)	EPA Health Advisory^b (ng/L)	Residential Risk-based Soil Screening Level^c (µg/kg)
PFOS	1763-23-1	NA	70.0 ^d	1,260
PFOA	335-67-1	NA		1,260
PFBS	375-73-5	400,000 ^e	NA	1,260,000

^a EPA RSL for tap water, May 2018.

^b *Drinking Water Health Advisory for Perfluorooctanoic Acid* (EPA 2016b) and *Drinking Water Health Advisory for Perfluorooctane Sulfonate* (EPA 2016a).

^c Residential risk-based soil screening levels determined by using the EPA RSL calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search) and the May 2018 EPA RSL tables (<https://epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2018>) for soil and sediment.

^d When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 70-ng/L health advisory value.

^e PFBS analytical results for groundwater and surface water have been compared to the tap water screening levels.

µg/kg = Micrograms per kilogram.

EPA = U.S. Environmental Protection Agency.

NA = Not available.

ng/L = Nanograms per liter.

PFBS = Perfluorobutane sulfonate.

PFOA = Perfluorooctanoic acid.

PFOS = Perfluorooctane sulfonate.

RSL = Regional screening level.

SI = Site inspection.

Table 3. Summary of SI Activities

PRL Name	Analyzed Parameters^a	Soil Borings	Soil Samples	Groundwater Samples	Surface Water Samples	Sediment Samples
2: New Fire Department – Building 180	PFOS/PFOA	2	4	2	NA	NA
3: Hangar 250	PFOS/PFOA	2	4	0 ^b	NA	NA
4: Hangar 255	PFOS/PFOA	3	6	1	NA	NA
5: Old Fire Department and Swale – Building 290	PFOS/PFOA	3	6	1	NA	1
6: Hangar 310	PFOS/PFOA	2	4	1	NA	NA
7: Hangar 380	PFOS/PFOA	2	4	1	1	1
8: Hangar 375	PFOS/PFOA	2	4	1	NA	NA
10: Ponds/Stormwater Retention Basins	PFOS/PFOA	0	2 ^c	1	5	5
11: Former IRP Site 7 Burn Pit	PFOS/PFOA	3	6	1	NA	NA

Notes:

-Two samples will be collected per boring—one from 0 to 2 ft BGS, and the second from the interval immediately above the water table. Actual depth of the subsurface sample will be the 2-ft interval above groundwater table.

-Field duplicates are not included in the sample quantities.

-Groundwater sampling also will include monitoring of field parameters: water level, pH, temperature, conductivity, oxidation-reduction potential, dissolved oxygen, and turbidity.

^a PFOS/PFOA is used generically in this Site Inspection Work Plan to include the following six 2012 third Unregulated Contaminant Monitoring Rule emerging contaminants: PFOS, PFOA, PFBS, perfluorononanoic acid, perfluoroheptanoic acid, and perfluorohexanesulfonate. All samples will be analyzed for PFOS/PFOA using U.S. Environmental Protection Agency, Method 537, revision 1.1.

^b Groundwater from PRL 3 is evaluated by co-located groundwater sample from PRL 4.

^c Soil samples from PRL 10 were collected while installing monitoring well MW-PRL10-01.

BGS = Below ground surface.

IRP = Installation Restoration Program.

NA = Not applicable.

PFBS = Perfluorobutane sulfonate.

PFOA = Perfluorooctanoic acid.

PFOS = Perfluorooctane sulfonate.

PRL = Potential release location.

SI = Site Inspection.

Table 4. Well Construction Details for Portland ANGB SI

Monitoring Well	Top of Casing Elevation (ft ANAVD88)	Ground Elevation (ft ANAVD88)	Screened Interval (ft BGS)	Total Well Depth (ft BTOC)	Well Diameter (in.)	Casing
PRL 2						
MW-POR02-01	18.06	18.22	5.0 – 15.0	15.50	2	PVC
MW-POR02-02	19.09	19.67	5.0 – 15.0	15.50	2	PVC
PRL 4						
MW-POR04-01	20.27	20.48	5.0 – 15.0	15.50	2	PVC
PRL 5						
MW-POR05-01	17.03	17.24	5.0 – 15.0	15.50	2	PVC
PRL 6						
MW-POR06-01	19.22	19.44	5.0 – 15.0	15.50	2	PVC
PRL 7						
MW-POR07-01	20.82	21.02	5.0 – 15.0	15.50	2	PVC
PRL 8						
MW-POR08-01	19.79	20.13	5.0 – 15.0	15.50	2	PVC

Table 4. Well Construction Details for Portland ANGB SI (continued)

Monitoring Well	Top of Casing Elevation (ft ANAVD88)	Ground Elevation (ft ANAVD88)	Screened Interval (ft BGS)	Total Well Depth (ft BTOC)	Well Diameter (in.)	Casing
<i>PRL 10</i>						
MW-POR10-01	21.78	22.08	5.0 – 15.0	15.50	2	PVC
<i>PRL 11</i>						
MW-POR11-01	28.73	28.86	5.0 – 15.0	15.50	2	PVC

Source: Top of casing elevation and ground surface elevation data for the new wells are from the monitoring well survey on May 31, 2018, by Statewide Land Surveying Inc. (see Appendix C). Screened interval, total depth, and well diameter data in this table were obtained from the well construction diagrams provided in Appendix A.

ANADV88 = Above North American Vertical Datum of 1988.

ANGB = Air National Guard Base.

BGS = Below ground surface.

BTOC = Below top of casing.

PRL = Potential release location.

PVC = Polyvinyl chloride.

SI = Site inspection.

Table 5. Water Level Measurements

Monitoring Well Identifier	TOC Elevation (ft ANADV88)	Screened Interval	May 2018	
			Depth to Water (ft BTOC)	Groundwater Elevation (ft ANADV88)
MW-POR02-01	18.06	5.0 – 15.0	5.20	12.86
MW-POR02-02	19.09	5.0 – 15.0	6.48	12.61
MW-POR04-01	20.27	5.0 – 15.0	5.29	14.98
MW-POR05-01	17.03	5.0 – 15.0	3.98	13.05
MW-POR06-01	19.22	5.0 – 15.0	4.34	14.88
MW-POR07-01	20.82	5.0 – 15.0	6.85	13.97
MW-POR08-01	19.79	5.0 – 15.0	7.07	12.72
MW-POR10-01	21.78	5.0 – 15.0	12.63	9.15
MW-POR11-01	28.73	5.0 – 15.0	8.18	20.55

Source: Top of casing elevation data for the new wells are from the monitoring well survey on May 31, 2018, by Statewide Land Surveying Inc. (See Appendix C). Screened interval data were obtained from the well construction diagrams provided in Appendix A. Depth to water data were obtained from groundwater sampling logs provided in Appendix B.

ANADV88 = Above North American Vertical Datum of 1988.

BTOC = Below top of casing.

TOC = Top of casing.

Table 6. Water Quality Parameters

Parameter	Groundwater								
	MW-POR02-01	MW-POR02-02	MW-POR04-01	MW-POR05-01	MW-POR06-01	MW-POR07-01	MW-POR08-01	MW-POR10-01	MW-POR11-01
Dissolved oxygen (mg/L)	3.64	3.48	0.78	1.62	1.81	1.04	4.94	0.38	1.74
ORP (mV)	118.3	32.6	0.8	-56.8	-35.2	-124.3	-78.9	251.7	-10.4
pH (S.U.)	6.69	6.89	6.39	7.17	6.58	7.06	7.80	5.41	6.22
Conductivity (mS/cm)	206	275	675	247	129	346	537	134	1073
Temperature (°C)	17.32	14.36	17.38	14.95	16.26	13.98	14.26	13.11	15.04
Turbidity (NTU)	17.5	25.2	14.4	9.8	23.4	48.2	20.4	20.3	23.6

Parameter	Surface Water					
	POR07-SW1-01	POR10-SW1-01	POR10-SW2-01	POR10-SW3-01	POR10-SW4-01	POR10-SW5-01
Dissolved oxygen (mg/L)	15.76	3.21	0.52	6.68	8.34	1.70
ORP (mV)	40.1	17.1	-35.4	-38.5	7.9	-2.8
pH (S.U.)	7.07	6.58	6.65	6.68	6.79	6.72
Conductivity (mS/cm)	135	232	241	243	262	245
Temperature (°C)	17.65	16.98	21.75	21.78	15.85	13.48
Turbidity (NTU)	60.1	138	38.7	40.9	33.2	38.7

°C = Degrees Celsius.
mg/L = Milligrams per liter.
mS/cm = MicroSiemens per centimeter.
mV = Millivolt.
NTU = Nephelometric turbidity unit.
ORP = Oxidation-reduction potential.
S.U. = Standard unit.

Table 7. Summary of Soil and Sediment Analytical Results

						Analyte Perfluorooctane Sulfonate (PFOS)	Perfluorooctanoic Acid (PFOA)	Perfluorobutane Sulfonate (PFBS)	Perfluoroheptanoic Acid (PFHpA)	Perfluorohexane Sulfonate (PFHxS)	Perfluorononanoic Acid (PFNA)
Screening Level ^a						1,260	1,260	1,260,000	NA	NA	NA
PRL	Location	Sample Identifier	Sample Date	Sample Depth (ft)	Sample Type	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
<i>Soil</i>											
2	POR02-SB1	POR02-SB1-01	5/23/18	0-2	REG	0.4 J	1.2	0.52 J	0.22 J	1.4	0.27 U
	POR02-SB1	POR02-SB1-01D	5/23/18	0-2	DUP	0.27 J	0.22 U	0.2 U	0.22 U	0.071 U	0.22 U
	POR02-SB1	POR02-SB1-02	5/23/18	6-8	REG	18	0.37 J	0.23 U	0.18 J	0.55	0.26 U
	POR02-SB2	POR02-SB2-01	5/25/18	0-2	REG	34 J	0.23 J	0.08 J	0.24 U	1.2	0.24 U
	POR02-SB2	POR02-SB2-02	5/25/18	5.5-7.5	REG	14	0.5	0.24 J	0.34 J	1.1	0.26 U
3	POR03-SB1	POR03-SB1-01	5/22/18	0-2	REG	0.34 J	0.21 U	0.19 U	0.21 U	0.12 J	0.21 U
	POR03-SB1	POR03-SB1-02	5/22/18	5-7	REG	0.63 U	0.25 U	0.23 U	0.25 U	0.25 U	0.25 U
	POR03-SB1	POR03-SB1-02D	5/22/18	5-7	DUP	0.64 U	0.26 U	0.23 U	0.26 U	0.26 U	0.26 U
	POR03-SB2	POR03-SB2-01	5/22/18	0-2	REG	0.73 J	0.23 U	0.21 U	0.23 U	0.16 J	0.23 U
	POR03-SB2	POR03-SB2-02	5/22/18	5.5-7.5	REG	0.36 J	0.26 U	0.23 U	0.26 U	0.17 J	0.26 U
4	POR04-SB1	POR04-SB1-01	5/25/18	1.5-3.5	REG	160 J	0.89	0.73	0.21 J	6.7	0.27 U
	POR04-SB1	POR04-SB1-02	5/25/18	7-9	REG	89 J	0.39 J	0.42 J	0.14 J	2.3	0.28 U
	POR04-SB2	POR04-SB2-01	5/23/18	.5-2.5	REG	0.63 U	0.25 U	0.23 U	0.25 U	0.25 U	0.25 U
	POR04-SB2	POR04-SB2-02	5/23/18	10-12	REG	0.7 U	0.28 U	0.25 U	0.28 U	0.28 U	0.28 U
	POR04-SB3	POR04-SB3-01	5/22/18	0-2	REG	0.63 U	0.25 U	0.23 U	0.25 U	0.25 U	0.25 U
	POR04-SB3	POR04-SB3-02	5/22/18	6-8	REG	0.66 U	0.27 U	0.24 U	0.27 U	0.27 U	0.27 U
5	POR05-SB1	POR05-SB1-01	5/22/18	0-2	REG	100 J	0.42	0.35 J	0.35 J	3.4	0.13 J
	POR05-SB1	POR05-SB1-01D	5/22/18	0-2	DUP	86 J	0.45	0.62	0.43	3.7	0.11 J
	POR05-SB1	POR05-SB1-02	5/22/18	6-8	REG	22	0.3 J	0.12 J	0.18 J	1.3	0.27 U
	POR05-SB2	POR05-SB2-01	5/22/18	0-2	REG	12	0.21 J	0.19 U	0.21 U	0.62	0.21 U
	POR05-SB2	POR05-SB2-02	5/22/18	11-13	REG	2.9	0.27 U	0.25 U	0.27 U	0.32 J	0.27 U
	POR05-SB3	POR05-SB3-01	5/22/18	0-2	REG	16	0.34 J	0.075 J	0.25 J	1.8	0.13 J
	POR05-SB3	POR05-SB3-02	5/22/18	5-7	REG	2.6	0.22 U	0.19 U	0.22 U	0.52	0.22 U

Table 7. Summary of Soil and Sediment Analytical Results (continued)

Analyte						Perfluorooctane Sulfonate (PFOS)	Perfluorooctanoic Acid (PFOA)	Perfluorobutane Sulfonate (PFBS)	Perfluoroheptanoic Acid (PFHpA)	Perfluorohexane Sulfonate (PFHxS)	Perfluorononanoic Acid (PFNA)
Screening Level ^a						1,260	1,260	1,260,000	NA	NA	NA
PRL	Location	Sample Identifier	Sample Date	Sample Depth (ft)	Sample Type	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
6	POR06-SB1	POR06-SB1-01	5/22/18	0-2	REG	11	0.14 J	0.19 U	0.22 U	0.51	0.22 U
	POR06-SB1	POR06-SB1-02	5/22/18	2-4	REG	8.7	0.21 U	0.19 U	0.21 U	0.24 J	0.21 U
	POR06-SB2	POR06-SB2-01	5/22/18	0-2	REG	8.8	0.2 U	0.18 U	0.2 U	0.34	0.2 U
	POR06-SB2	POR06-SB2-02	5/22/18	2-4	REG	2.7	0.22 U	0.19 U	0.22 U	0.13 J	0.22 U
7	POR07-SB1	POR07-SB1-01	5/22/18	0-2	REG	7	0.18 J	0.19 U	0.21 U	0.25 J	0.12 J
	POR07-SB1	POR07-SB1-02	5/22/18	5.5-7.5	REG	2.5	0.22 U	0.2 U	0.22 U	0.082 J	0.22 U
	POR07-SB2	POR07-SB2-01	5/22/18	0-2	REG	0.55 U	0.22 U	0.63	0.25 J	0.26 J	0.22 U
	POR07-SB2	POR07-SB2-01	5/22/18	6-8	REG	1.4	0.28 J	0.25 J	0.2 J	0.26 J	0.21 U
8	POR08-SB1	POR08-SB1-01	5/24/18	0-2	REG	6.1 J	0.2 U	0.18 U	0.2 U	0.2 U	0.2 U
	POR08-SB1	POR08-SB1-02	5/24/18	5-7	REG	3.3	0.21 U	0.19 U	0.21 U	0.21 U	0.21 U
	POR08-SB1	POR08-SB1-02D	5/24/18	5-7	DUP	3	0.21 U	0.19 U	0.21 U	0.21 U	0.21 U
	POR08-SB2	POR08-SB2-01	5/24/18	0-2	REG	0.31 J	0.21 U	0.18 U	0.21 U	0.093 J	0.21 U
	POR08-SB2	POR08-SB2-02	5/24/18	4.5-6.5	REG	20	0.22 U	0.2 U	0.22 U	0.19 J	0.22 U
10	MWPOR10-SB1	MWPOR10-SB1-01	5/23/18	0-2	REG	6.8	0.14 J	0.077 J	0.21 U	0.46	0.21 U
	MWPOR10-SB1	MWPOR10-SB1-02	5/23/18	6-8	REG	1.3	0.22 U	0.2 U	0.22 U	0.09 J	0.22 U
11	POR11-SB1	POR11-SB1-01	5/23/18	0-2	REG	20	27	0.2 U	0.22 J	0.81	0.23 U
	POR11-SB1	POR11-SB1-02	5/23/18	11-13	REG	17	23	0.14 J	0.29 J	19	0.23 J
	POR11-SB2	POR11-SB2-01	5/23/18	0.5-2.5	REG	30 J	3.1	0.19 J	0.34	13	0.23 U
	POR11-SB2	POR11-SB2-02	5/23/18	12-14	REG	5	31 J	0.27 J	0.71	17	0.25 U
	POR11-SB2	POR11-SB2-02D	5/23/18	12-14	DUP	6.7	25 J	0.32 J	0.75	18	0.24 U
	POR11-SB3	POR11-SB3-01	5/23/18	0.5-2.5	REG	1100 J	10	0.87	1.7	33 J	0.81 J
	POR11-SB3	POR11-SB3-02	5/23/18	11-13	REG	1.1 J	7.2	1.9	5	16	0.25 U

Table 7. Summary of Soil and Sediment Analytical Results (continued)

						Analyte						
						Perfluorooctane Sulfonate (PFOS)	Perfluorooctanoic Acid (PFOA)	Perfluorobutane Sulfonate (PFBS)	Perfluoroheptanoic Acid (PFHpA)	Perfluorohexane Sulfonate (PFHxS)	Perfluorononanoic Acid (PFNA)	
Screening Level ^a						1,260	1,260	1,260,000	NA	NA	NA	
PRL	Location	Sample Identifier	Sample Date	Sample Depth (ft)	Sample Type	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	
<i>Sediment</i>												
5	POR05-SD1	POR05-SD1-01	5/24/18	Surface	REG	210 J	1.7	0.86 J	0.68 J	34	0.72 J	
7	POR07-SD1	POR07-SD1-01	5/29/18	Surface	REG	1800 J	50	12	6.6 J	100	16	
10	POR10-SD1	POR10-SD1-01	5/23/18	Surface	REG	19	0.23 J	0.11 J	0.29 U	1.1	0.29 U	
	POR10-SD2	POR10-SD2-01	5/23/18	Surface	REG	18	0.18 J	0.28 U	0.32 U	0.96	0.32 U	
	POR10-SD3	POR10-SD3-01	5/23/18	Surface	REG	68	0.7 J	0.35 J	0.81 U	4	0.81 U	
	POR10-SD4	POR10-SD4-01	5/29/18	Surface	REG	85	1.3 J	0.63 J	1.4 U	6.6	1.4 U	
	POR10-SD5	POR10-SD5-01	5/31/18	Surface	REG	22	0.49 J	0.8 U	0.89 U	1.6	0.89 U	

^a U.S. Environmental Protection Agency (EPA) residential risk-based soil screening level determined using the EPA regional screening level (RSL) calculator and May 2018 EPA RSL tables.

Bold denotes detected concentration.

Bold highlighted denotes concentration that exceeds screening criteria.

µg/kg = Micrograms per kilogram.

DUP = Duplicate.

NA = Not applicable.

PRL = Potential release location.

REG = Regular.

Data Qualifiers:

J = Estimated concentration.

U = Chemical not detected above the laboratory detection limit.

Table 8. Summary of Groundwater and Surface Water Analytical Results

Analyte						Perfluorooctane Sulfonate (PFOS)	Perfluorooctanoic Acid (PFOA)	PFOS+PFOA	Perfluorobutane Sulfonate (PFBS)	Perfluoroheptanoic Acid (PFHpA)	Perfluorohexane Sulfonate (PFHxS)	Perfluorononanoic Acid (PFNA)
Health Advisory ^a						70	70	70	NA	NA	NA	NA
EPA RSL Tap Water ^b						NA	NA	NA	NA	NA	NA	400,000
PRL	Location	Sample Identifier	Sample Date	Sample Depth (ft)	Sample Type	(ng/L)	(ng/L)	(ng/L)	(ng/L)	(ng/L)	(ng/L)	(ng/L)
<i>Groundwater</i>												
2	MW-POR02-01	MW-POR02-01-01	5/31/18	10.0	REG	42000 J	970 J	42970 J	260	350	1800 J	43 J
	MW-POR02-02	MW-POR02-02-01	5/31/18	10.0	REG	2100 J	560 J	2660 J	430 J	390 J	2100 J	19
4	MW-POR04-01	MW-POR04-01-01	5/31/18	10.0	REG	220	53	273	6.3	22	36	12
5	MW-POR05-01	MW-POR05-01-01	5/29/18	10.0	REG	2300 J	40	2340 J	40	13	600 J	0.87 J
6	MW-POR06-01	MW-POR06-01-01	5/29/18	10.0	REG	690 J	30	720 J	19	9.4	1400 J	3
7	MW-POR07-01	MW-POR07-01-01	5/29/18	10.0	REG	310	45	355	8.8	14	53	11
8	MW-POR08-01	MW-POR08-01-01	5/31/18	10.0	REG	370	180	550	19	11	260	2.8
10	MW-POR10-01	MW-POR10-01-01	5/31/18	10.0	REG	160 J	12 J	172 J	42 J	5.8 J	630 J	2 J
11	MW-POR11-01	MW-POR11-01-01	5/31/18	10.0	REG	7800 J	24000 J	31800 J	300	400 J	11000 J	9.4
<i>Surface Water</i>												
7	POR07-SW1	POR07-SW1-01	5/29/18	Surface	REG	3000 J	360	3360 J	97	89	870 J	87
10	POR10-SW1	POR10-SW1-01	5/23/18	Surface	REG	1500 J	63	1563 J	110	38	570 J	4
	POR10-SW2	POR10-SW2-01	5/23/18	Surface	REG	1000 J	52	1052 J	79	30	460 J	3.9
	POR10-SW3	POR10-SW3-01	5/23/18	Surface	REG	1700 J	44	1744 J	61	27	390 J	6.8
	POR10-SW4	POR10-SW4-01	5/29/18	Surface	REG	1500 J	95 J	1595 J	140 J	53 J	790 J	5.3 J
	POR10-SW5	POR10-SW5-01	5/31/18	Surface	REG	1500 J	64	1564 J	81	35	450 J	4.1

^a May 2016 EPA health advisory for PFOS/PFOA combined.^b May 2018 EPA RSL for tap water.**Bold** denotes detected concentration.**Bold highlighted** denotes concentration that exceeds screening criteria.

EPA = U.S. Environmental Protection Agency.

NA = Not applicable.

ng/L = Nanograms per liter.

PRL = Potential release location.

REG = Regular.

RSL = Regional screening level.

Data Qualifiers:

J = Estimated concentration.

U = Chemical not detected above the laboratory detection limit.

Table 9. SI Recommendation Summary Table

PRL No.	PRL Description	Constituents Above Screening Criteria	Sampling Recommendations and Objectives
2	New Fire Department – Building 180	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
3	Hangar 250	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
4	Hangar 255	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
5	Old Fire Department and Swale – Building 290	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Surface Water and Sediment: Determine PFOS/PFOA impact to sediment and surface water through additional sampling of surface water and sediment at the drainage swale.
6	Hangar 310	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
7	Hangar 380	Groundwater: PFOS + PFOA Surface Water: PFOS + PFOA Sediment: PFOS	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Surface Water and Sediment: Determine PFOS/PFOA impact to sediment and surface water through additional upgradient sampling of surface water and sediment and evaluate potential downgradient impacts.

Table 9. SI Recommendation Summary Table (continued)

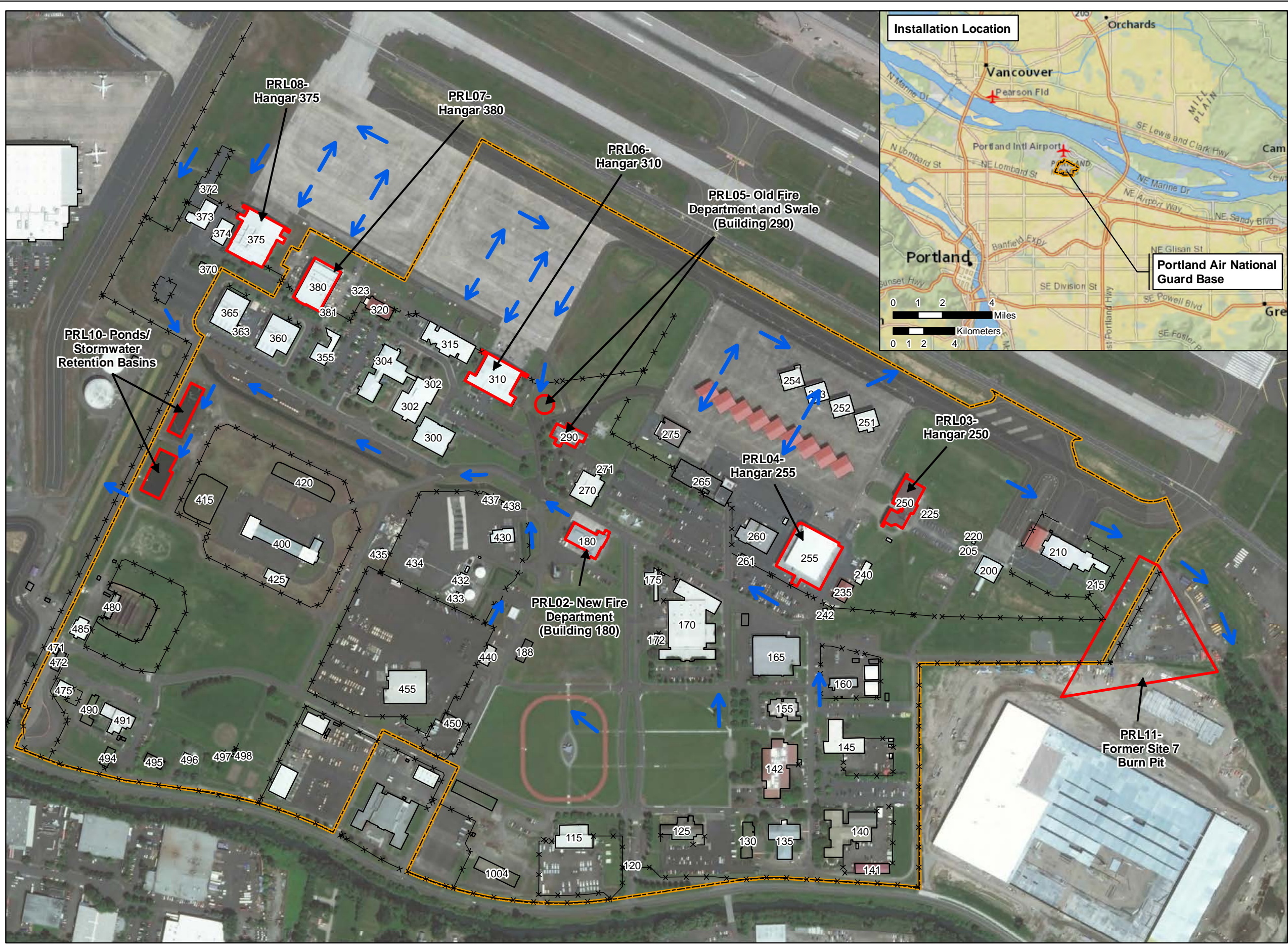
PRL No.	PRL Description	Constituents Above Screening Criteria	Sampling Recommendations and Objectives
8	Hangar 375	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
10	Ponds/Stormwater Retention Basins	Groundwater: PFOS + PFOA Surface water: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Surface Water and Sediment: Determine PFOS/PFOA impact to surface water through additional upgradient sampling of surface water and sediment and evaluate potential downgradient impacts.
11	Former IRP Site 7 Burn Pit	Groundwater: PFOS + PFOA	Soil: Although screening criteria were not exceeded, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration. Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells.
General			Soil: Collect additional surface and subsurface soil samples to determine the nature and extent both vertically and horizontally of PFOS/PFOA contamination. Analyze for an expanded list of PFOS/PFOA compounds to evaluate for potential precursor compounds. Groundwater: (1) Collect additional groundwater samples in upgradient locations to quantify potential impacts from upgradient sources; (2) collect additional groundwater samples off Base through the installation of a limited number of new monitoring wells to determine if PFAS impacts beyond the Base boundary are increasing or decreasing. Surface Water/Sediment: (1) Collect additional surface water and sediment samples in upgradient locations to quantify potential impacts from upgradient sources; (2) collect additional surface water and sediment samples from downgradient locations and off Base to determine PFAS impacts beyond the Base boundary.

IRP = Installation Restoration Program.
PFOA = Perfluorooctanoic acid.
PFOS = Perfluorooctane sulfonate.
PRL = Potential release location.
SI = Site inspection.

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FIGURES

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LEGEND:

- Potential Release Location (PRL)
- Installation Boundary*
- Building*
- Fence*
- Storm Water Flow

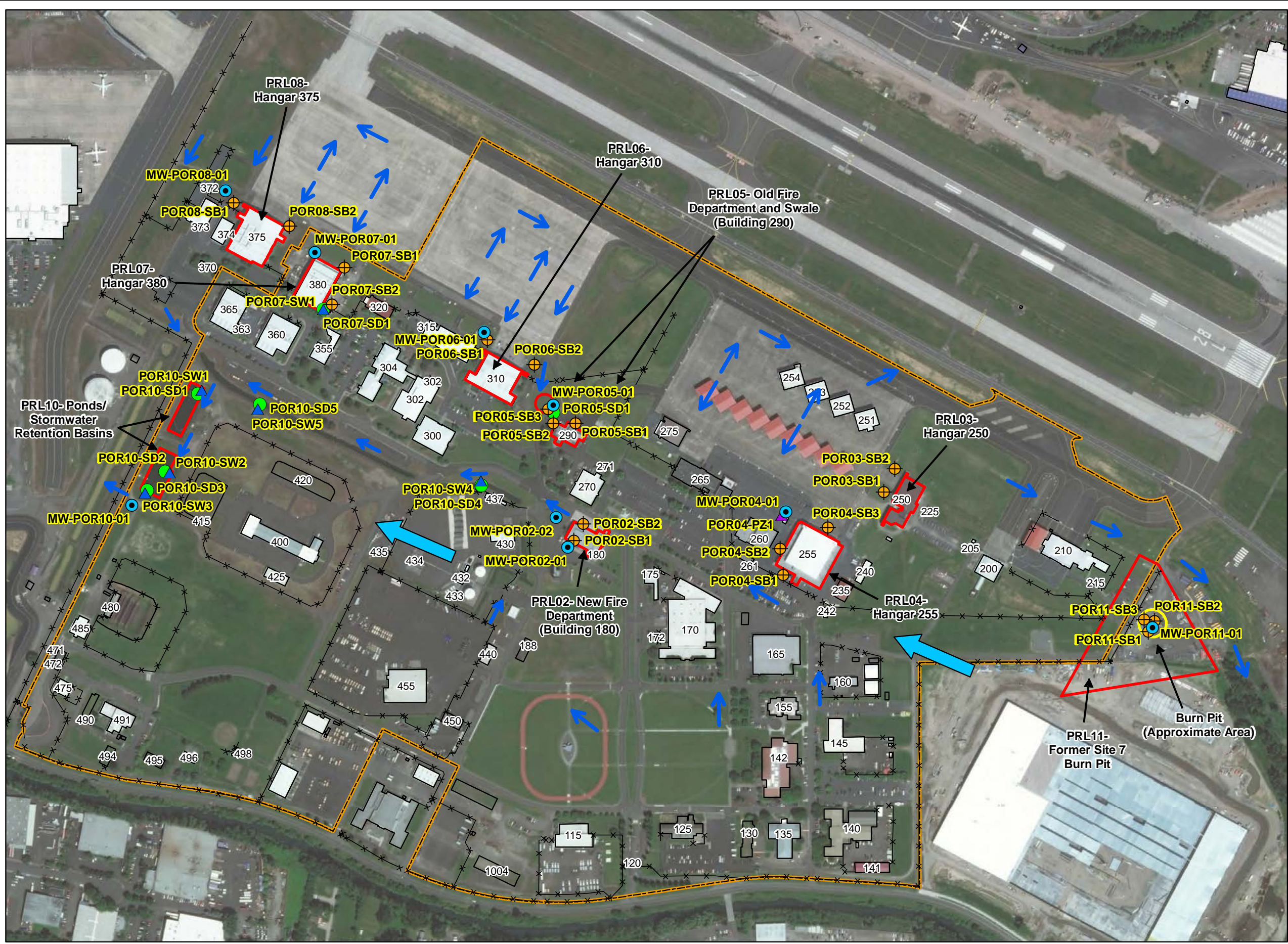
NOTES:

- * Source: Common Installation Picture (CIP) geodatabase provided by ANG GeoBase on 07/26/2017.
- 1. Storm water flow path based on 2006 Environmental Baseline Survey.
- 2. Background Source: ESRI World Imagery (DigitalGlobe, 05/2017).

PORTLAND
AIR NATIONAL GUARD BASE
PORTLAND, OREGON

PORTLAND ANGB
LOCATION MAP

FIGURE: 1 DATE: 9/6/2018



LEGEND:

- SI Monitoring Well
- Soil Boring
- Surface Water Sample
- Sediment Sample
- Temporary Piezometer
- Site Feature
- Potential Release Location (PRL)
- Installation Boundary*
- Building*
- Fence*
- Inferred Regional Groundwater Flow
- Storm Water Flow

POR03-SB1 Location Identifier

NOTES:

- * Source: Common Installation Picture (CIP) geodatabase provided by ANG GeoBase on 07/26/2017.
- 1. Storm water flow path based on 2006 Environmental Baseline Survey.
- 2. The general groundwater flow direction was inferred using historical and 2018 SI water level measurements.
- 3. Background Source: ESRI World Imagery (DigitalGlobe, 05/2017).

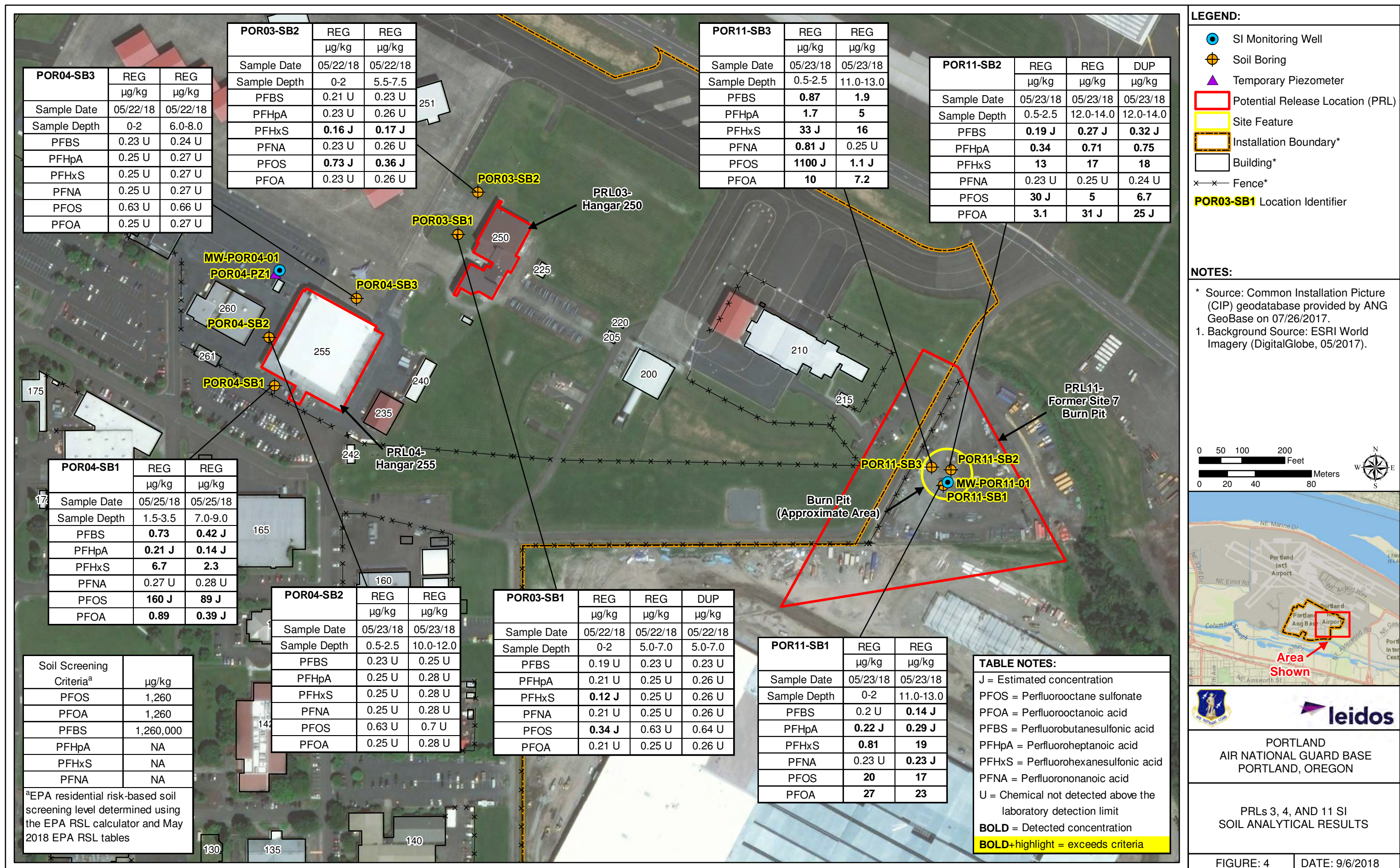
0 150 300 600 Feet

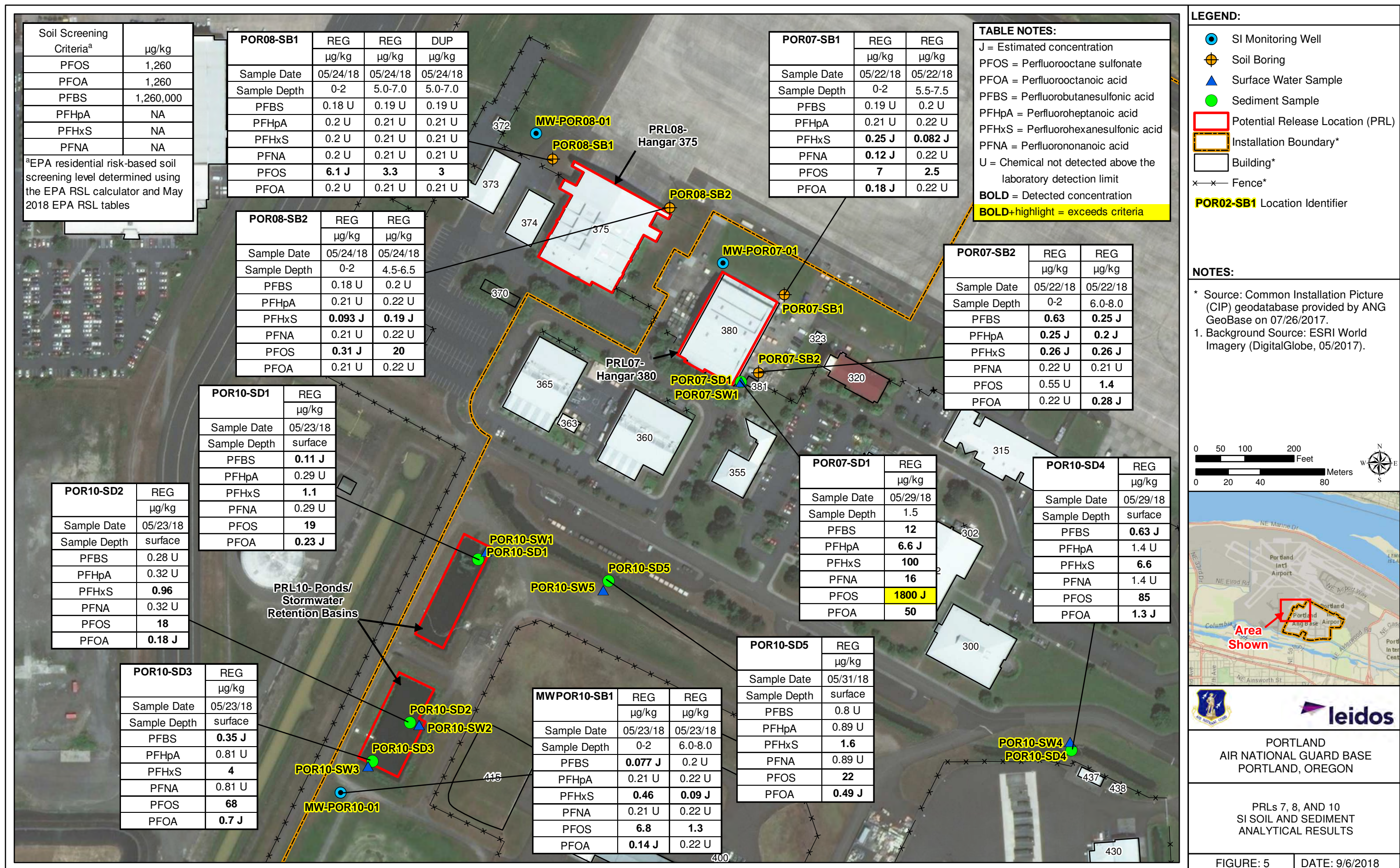
0 25 50 100 Meters

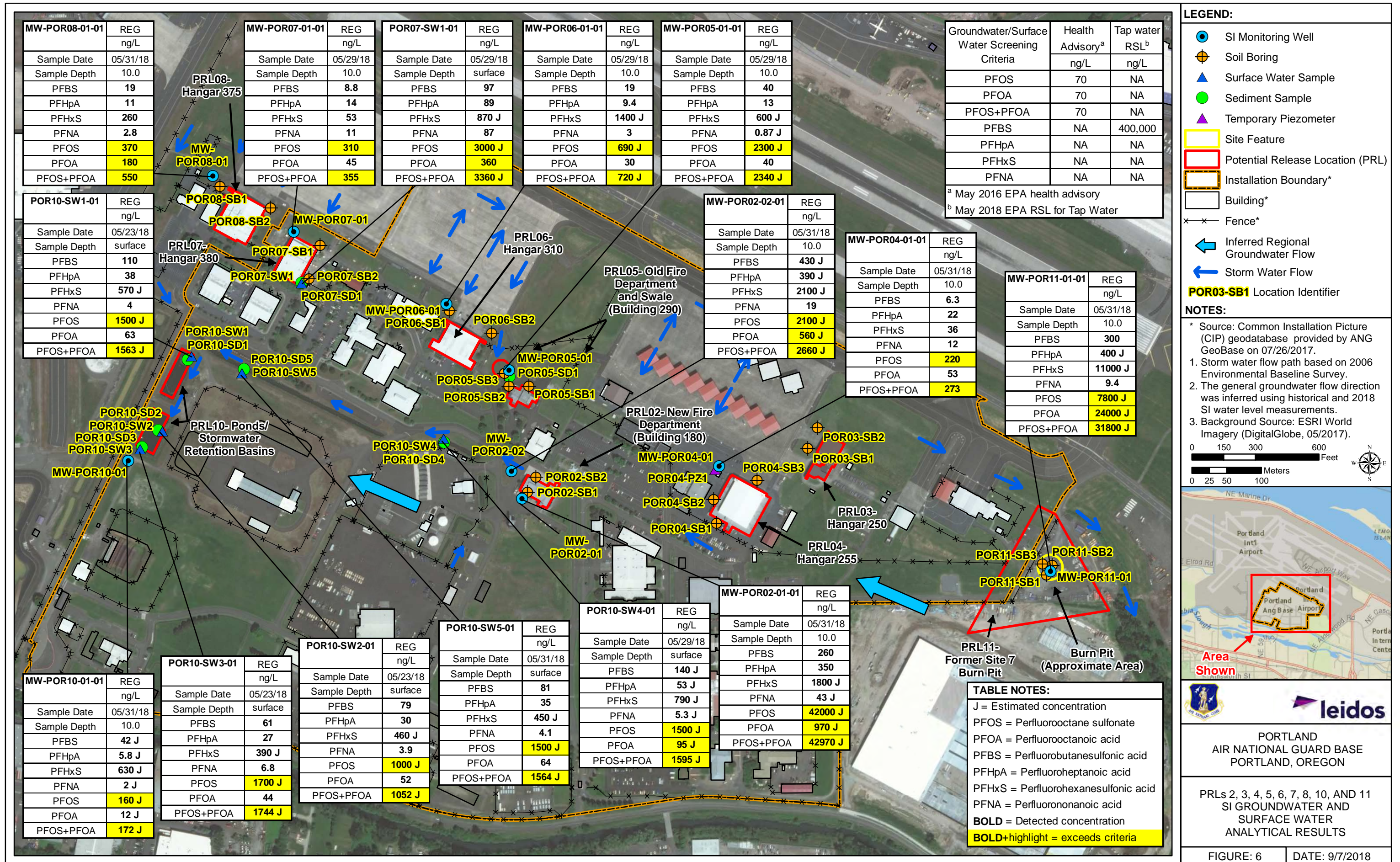
PORTLAND
AIR NATIONAL GUARD BASE
PORTLAND, OREGON

PORTLAND ANGB
SI SAMPLING OVERVIEW MAP

FIGURE: 2 | DATE: 9/6/2018







APPENDIX A

SOIL BORINGS AND WELL CONSTRUCTION LOGS

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Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR05-SB 1
Project FY17 Phase 3 Regional St for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Size and Type of Drilling and Sampling Equipment DPT Geoprobe 7822DT		Borehole Location Description PRL05 North side of B290	
Date/Time Started : May 22, 2018 0850		Date/Time Finished : May 22, 2018 0900	
Overburden Thickness ~12" asphalt	Depth to Groundwater (ft) 8'	Total Depth (ft) 10' (logged) 15' PZ TD	
Sample for PFOS/PFOA Analysis Sample ID: POR05-SB1-01 + FD Sample Interval: 0 to 2 ft @0855		Sample for PFOS/PFOA Analysis Sample ID: POR05-SB1-02 + MS/MSD Sample Interval: 6 to 8 ft @0858	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/4" bentonite / 1' cement	Date Backfilled : May 24, 2018	
Latitude 45.57994726N	Longitude 122.59549691W	Elevation (ft) 23.97'	
Notes: Install 3/4" temp piezometer, plugged 5/24/18			
Sketch:			
<p style="text-align: center;">● POR05-SB1 (PZ)</p> <p style="text-align: center;">B290</p>			
NOT TO SCALE 			

Client/Installation ANG/PORTLAND ANGI		Borehole Number POR05-SB 1		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	Dark grey silty clay, very plastic, medium moisture 2.54 3/0	0.0	POR05-SB1-01 @0855 +POR05-SB1-01D	*Depth begins below asphalt ~12" asphalt	
1					
1.5					
2					
2.5			NA		
3					
3.5					
4					
4.5					
5	Same as 0-5'	0.0	NA		
5.5					
6	Med grey silty clay, very plastic, med moisture 2.54 4/0		POR05-SB1-02 @0858 +MS/MSD		
6.5					
7	Med brown, med tight clay w/red nodules 104R 4/2				
7.5					
8	~~~~~ wet ~~~~~ Med brown, wet loose clay w/red nodules 104R 4/2		NA		
8.5					
9					
9.5					
10	± END LITH - PZ set @ 15'				

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR05-SB1		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
10.5	Not Logged				
11.0					
11.5					
12.0					
12.5					
13.0					
13.5					
14.0					
14.5					
15.0					
15.5					
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					

Handwritten notes and markings on the log:

- "Not Logged" written in the Description of Materials column from 10.5 to 19.5 depth.
- "PZ SET TD" written in the Description of Materials column at 15.0 depth.
- A horizontal line drawn across the log at 15.5 depth, starting from the left margin and ending at the right margin.
- A diagonal line drawn from approximately 16.5 depth on the right margin to 17.5 depth on the left margin.
- A diagonal line drawn from approximately 18.5 depth on the left margin to 19.5 depth on the right margin.
- "DA" written in the Headspace Reading (ppm) column at 17.0 depth.

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR05-SB1		Page Page 4 of 4	
Project FV17 Phase 3 Regional SI for PPOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR05-SB 1
SAMPLE LOCATION:	B290, PR205
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	Sample No. 1
SAMPLE ID NUMBER:	POR05-SB 1-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 0855

+ Field Dupe

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	Sample No. 2
SAMPLE ID NUMBER:	POR05-SB 1-02
SAMPLE DEPTH (FT):	6-8'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 0858

+ MS/MSD

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" Insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
Denae Athay <i>Denae Athay</i>			
COMPANY Leldos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR05-SB2
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PR L05 West side of B290	
Date/Time Started : May 22, 2018 0927		Date/Time Finished : May 22, 2018 0945	
Overburden Thickness 2"	Depth to Groundwater (ft) 13'	Total Depth (ft) 15'	
Sample for PFOS/PFOA Analysis		Sample for PFOS/PFOA Analysis	
Sample ID: POR05-SB2-01		Sample ID: POR05-SB2-02 @ 0940	
Sample Interval: 0 to 2 ft @ 0930		Sample Interval: 11 to 13 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/4" bentonite / 1' cement	Date Backfilled : May 24, 2018	
Latitude 45.5799658°W	Longitude 122.59585456°W	Elevation (ft) 10.02'	
Notes: 3/4" Temporary Piezometer installed, plugged 5/24/18			
Sketch:			

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO5-SB2		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	grass	0.0	PORO5-SB2-01		
1	Soft, light brown, loose dry silty, clay 5/4R 5/2		@0930		
1.5					
2					
2.5	Dark brown, tight, plastic, very dry clay		NA		
3					
3.5	10 4R 3/2				
4					
4.5					
5					
5.5	Dark grey, tight, plastic, dry clay	0.0	NA		
6					
6.5	2.5 4 3/0				
7					
7.5					
8					
8.5	Med grey, tight, plastic, moist				
9					
9.5	2.5 4 4/0				
10					

Client/Installation ANG/PORTLAND ANGB		Borehole Number POROS-SB 2		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
10.5	Dark grey, loose, moist silty clay 2.54 3/0	0.0	POROS- SB2-02 @ 0940		
11.0					
11.5					
12.0					
12.5					
13.0	Wet				
13.5	Dark brown, loose, wet silty clay 104R 3/2				
14.0					
14.5					
15.0					
15.5	END # Set Piezometer				
16.0					
16.5					
17.0					
17.5		DA			
18.0					
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR05-SB2		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFO5/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR05-SB2
SAMPLE LOCATION:	B290, PRL05
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
Sample No. 1	
SAMPLE ID NUMBER:	POR05-SB2-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 0930

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
Sample No. 2	
SAMPLE ID NUMBER:	POR05-SB2-02
SAMPLE DEPTH (FT):	11-13'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 0940

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" Insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
Danae Athay <i>Danae Athay</i>			
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR0 5-SB 3
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page <u>1</u> of <u>4</u>
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRLOS East of B310	
Date/Time Started : May 22, 2018 0955		Date/Time Finished : May 22, 2018 1010	
Overburden Thickness 6"	Depth to Groundwater (ft) 7.0	Total Depth (ft) 10	
Sample for PFOS/PFOA Analysis Sample ID: POR0 5-SB 2-01 Sample Interval: 0 to 2 ft @ 0958		Sample for PFOS/PFOA Analysis Sample ID: POR0 5-SB 2-02 Sample Interval: 5.0 to 7.0 ft @ 1002	
Inspector Name Denae Athay		Inspector Signature	
Monitoring Well ID : NA	Backfill Type Top 1' 3/8" bentonite / cement	Date Backfilled : May 22, 2018	
Latitude 45.58017866° N	Longitude 122.5958330° W	Elevation (ft) 6.06'	
Notes:			
<p>Sketch:</p> <p>concrete</p> <p>B310</p> <p>POR05-SB3</p> <p>grassy area</p> <p>drainage ditch</p> <p>B290</p> <p>NOT TO SCALE</p> <p>N W E S</p>			

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR05-SB3		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	grass	0.0	POR05-SB2-01 @0955		
1	Medium brown, loose, sand, low plasticity 54R 4/1		NA		
2					
2.5					
3	Med brown and grey clay, plastic, tight and very dry 54R 4 1/2				
3.5					
4					
4.5					
5					
5.5	Medium grey, plastic, tight, dry clay 2.5 4 4/0	0.0	POR05-SB2-02 @1002		
6					
6.5					
7	Wet Med. brown wet sand 7.5 4R 3/2		NA		
7.5					
8	Medium grey, loose, wet, plastic, silty clay 2.5 4 4/0				
8.5					
9					
9.5	Same as 7.5-9' but w/red nodules				
10					

END

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 5-SB 3		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5					14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR05-SB 3		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFO3/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25					
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POROS-SB 3
SAMPLE LOCATION:	PRL05, E of B310
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data		Sample No. 1
SAMPLE ID NUMBER:	PORO 5-SB 3-01	
SAMPLE DEPTH:	0-2'	

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 0958

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data		Sample No. 2
SAMPLE ID NUMBER:	PORO 5-SB 3-02	
SAMPLE DEPTH (FT):	5-7	

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1002

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY: Denae Athay <i>Denae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB	Oversight Contractor Leidos	Borehole Number POR06-SB 2
Project FY17 Phase 3 Regional SI for PFOS/PFOA	Driller : Stratus ANG/PORTLAND ANGB	Page Page <u>1</u> of <u>4</u>
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL 06 NE corner B310
Date/Time Started : May 22, 2018 1107		Date/Time Finished : May 22, 2018 145^{PM} 1120
Overburden Thickness 2"	Depth to Groundwater (ft) 4'	Total Depth (ft) log 6'/PZ TD 10'
Sample for PFOS/PFOA Analysis Sample ID: POR06-SB 2-01 @ 1109 Sample Interval: 0 to 2 ft		Sample for PFOS/PFOA Analysis Sample ID: POR06-SB 2-02 @ 1112 Sample Interval: <u>2</u> to <u>4</u> ft
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>
Monitoring Well ID : NA	Backfill Type 3/8" bentonite / cement	Date Backfilled : May 24, 2018
Latitude 45.58066605°N	Longitude 122.59617157°W	Elevation (ft) 12.71'
Notes: 3/4" Temporary Piezometer Installed TD 10'		
Sketch: 		

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 4-SB 2		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	grassy Light grey, loose, dry sand/silt, low plasticity 10YR 6/1	0.0	POR 06- SB2-01 @ 1109		
1.5	Medium brown, moist Sand, low plasticity 7.5 YR 3/2				
2.5			POR 06- SB2-02 @ 1112		
4.0	WET Med. brown, wet Sand, low plasticity 7.5 YR 3/2		NA		
5.0	END Lith	NA	NA		
6.0					
7.0					
8.0					
9.0					
10.0	Set PZ TD 10'				

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>6-SB 2</u>		Page Page <u>3</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: <u>May 22, 2018</u>	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5					14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 6-SB 2		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOA/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25					
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR06-SB 2
SAMPLE LOCATION:	PR06 - NE Corner B310
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
Sample No. 1	
SAMPLE ID NUMBER:	POR06-SB-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1109

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	

Sample Data	
Sample No. 2	
SAMPLE ID NUMBER:	POR06-SB-02
SAMPLE DEPTH (FT):	2-4'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1112

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" Insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY: Danae Athay <i>Danae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR06-SB1
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page <u>1</u> of <u>4</u>
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRLO6 NW corner of B310	
Date/Time Started : May 22, 2018 1135		Date/Time Finished : May 22, 2018 1142	
Overburden Thickness 4"	Depth to Groundwater (ft) 4'	Total Depth (ft) 5'	
Sample for PFOS/PFOA Analysis Sample ID: POR06-SB1-01 Sample Interval: 0 to 2 ft		Sample for PFOS/PFOA Analysis Sample ID: POR06-SB1-02 Sample Interval: 2 to 4 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : MW-POR NA 06-01	Backfill Type 3/8" boreplug / cement	Date Backfilled : May 22, 2018	
Latitude 45.58095400°N	Longitude 122.59694356°W	Elevation (ft) 7.04'	
Notes:			
<p>Sketch:</p> <p>The sketch is a hand-drawn map on a grid. It shows a 'grassy area' on the left, an 'asphalt' area at the top, and a 'Concrete' area on the right. A line labeled 'B315' runs diagonally from the top left. Another line labeled 'B310' runs diagonally from the bottom center. A point labeled 'POR06-SB1' is marked with a dot in the asphalt area. A compass rose in the bottom right corner shows North (N), South (S), East (E), and West (W). The text 'NOT TO SCALE' is written near the compass rose.</p>			

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR06-SB1		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	grass	0.0	POR06-SB1-01 @ 1137		
1					
1.5	Dark brown clay, tight, low moisture 104R 3/2				
2					
2.5	Medium brown, moist sand, low plasticity 104R 4/2		POR06-SB1-02 @ 1139		
3					
3.5					
4	WET				
4.5	Same as above				
5	END				
5.5					
6					
6.5					
7					
7.5					
8					
8.5					
9					
9.5					
10					

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>6-SB1</u>		Page Page <u>3</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: <u>May 22, 2018</u>	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					
11.0					
11.5					
12.0					
12.5					
13.0					
13.5					
14.0					
14.5					
15.0					
15.5					
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>6-SB 1</u>		Page Page <u>4</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: <u>May 22, 2018</u>	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30				30.0	

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR06-SB 1
SAMPLE LOCATION:	PRL 06 - NW corner B310
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
Sample No. 1	
SAMPLE ID NUMBER:	POR06-SB 1-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1137

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
Sample No. 2	
SAMPLE ID NUMBER:	POR06-SB 1-02
SAMPLE DEPTH (FT):	2-4'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1137

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY: Denae Athay <i>Denae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR02-SB1
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822DT		Borehole Location Description PAL2 Inside Bay 7 of B180	
Date/Time Started : May 23, 2018 1314		Date/Time Finished : May 23, 2018 1341	
Overburden Thickness 10" concrete	Depth to Groundwater (ft) 8'	Total Depth (ft) 10'	
Sample for PFOS/PFOA Analysis		Sample for PFOS/PFOA Analysis	
Sample ID: POR02-SB1-01 @ 1336 + FD		Sample ID: POR02-SB1-02 1341	
Sample Interval: 0 to 2 ft		Sample Interval: 6 to 8 ft	
Inspector Name Danae Athay		Inspector Signature <i>Danae Athay</i>	
Monitoring Well ID: NA	Backfill Type 3/8" bentonite, 1' concrete	Date Backfilled : May 23, 2018	
Latitude 45.57864326°N	Longitude 122.5954676	Elevation (ft) Not working	
Notes: Coordinates not very accurate inside building Just outside building 45.57865672, 122.59546182			
Sketch:			
<div style="text-align: right;">NOT TO SCALE</div>			

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO2-SB 1		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	Brown, grey, and black Dry Sand 54R 4/1	0.0	POR02-SB1-01 @ 1336 + FD	* 10" concrete depth start below concrete	
1	Medium brown, dry, plastic, clay w/ 20% 1" rocks (some look like old asphalt) 54R 2.5/2				
1.5	Medium brown hard, plastic, dry clay w/ red motiles 54R 4/2				
2					
2.5					
3					
3.5					
4					
4.5					
5					
5.5	1/2"-1" angular gravel	0.0			
6					
6.5	Moist, brown silty clay, very plastic 104R 3/4		POR02-SB1-02 @ 1341		
7					
7.5					
8	wet				
8.5	same as above				
9					
9.5					
10	END				

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 2-SB1		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5					14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 2-SB 1		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25					
25.5		DA			
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR02-SB 1
SAMPLE LOCATION:	B180, Bay 7
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	Sample No. 1
SAMPLE ID NUMBER:	POR02-SB 1-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS	
PID	0	ppm	

Date/Time: May 23, 2018 1336
+FD

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	Sample No. 2
SAMPLE ID NUMBER:	POR02-SB 1-02
SAMPLE DEPTH (FT):	6-8

FIELD	READING	UNITS	
PID	0	ppm	

Date/Time: May 23, 2018 1341

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
Denae Athay <i>Denae Athay</i>			
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR011-SB 2
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL11 North side of burn pit	
Date/Time Started : May 23, 2018 0757		Date/Time Finished : May 23, 2018 0815	
Overburden Thickness 6" gravel	Depth to Groundwater (ft) 14'	Total Depth (ft) 15'	
Sample for PFOS/PFOA Analysis		Sample for PFOS/PFOA Analysis	
Sample ID: POR011-SB2-01 @ 0802		Sample ID: POR011-SB2-02 @ 0811	
Sample Interval: 0 to 2 ft - 0.5 - 2.5'		Sample Interval: 12 to 14 ft + FA	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite, 1' cement	Date Backfilled : May 23, 2018	
Latitude 45.57762449°N	Longitude 122.58583669	Elevation (ft) 21.36'	
Notes:			
Sketch:			
NOT TO SCALE			

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR 11-SB 2		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	1/4" - 1" angular gravel				
1	Medium brown, moist, plastic, silty clay	3.7	POR 11-SB 2-01 @ 0802		
1.5	10 4R 3/2	ppm			
2					
2.5					
3					
3.5	Dark grey, tight, plastic, med moisture clay	33.7	NA		
4	2.54 3/0	ppm			
4.5					
5	Same as above				
5.5		36.5			
6	gravel 1/2-1" angular				
6.5		0.8			
7	Dark grey silty clay, med moist very plastic	1.8			
7.5					
8	2.54 3/0	8.8			
8.5					
9					
9.5		16.8			
10					

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR11-SB 2		Page Page 3 of 4
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes
10.5	same as above	5.4		
11.0	gravel 1/2"-1" angular			
11.5	same as 6.5-10"	169.6		
12.0				
12.5				
13.0				
13.5				
14.0	Wet			
14.5				
15.0	END			
15.5				
16.0				
16.5				
17.0				
17.5				
18.0				
18.5				
19.0				
19.5				
20.0				

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR011-SB 2		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25					
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR 011 -SB2
SAMPLE LOCATION:	PRL11 - Burn Pit
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
SAMPLE ID NUMBER:	POR 011 -SB2-01
SAMPLE DEPTH:	0-2'

0.5-2.5'

FIELD	READING	UNITS
PID	370	ppm

Date/Time: May 23, 2018 0802

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
SAMPLE ID NUMBER:	POR 011 -SB2-02
SAMPLE DEPTH (FT):	12-14

+FD

FIELD	READING	UNITS
PID	169.6	ppm

Date/Time: May 23, 2018 0811

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY: Denae Athay <i>Denae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR011-SB1
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL 11 Center of burn pit	
Date/Time Started : May 23, 2018 0815		Date/Time Finished : May 23, 2018 0835	
Overburden Thickness 8" gravel	Depth to Groundwater (ft) 13	Total Depth (ft) 15	
Sample for PFOS/PFOA Analysis		Sample for PFOS/PFOA Analysis	
Sample ID: POR011-SB1-01 @0821		Sample ID: POR011-SB1-02 @0830	
Sample Interval: 0 to 2 ft 8" - 2'8"		Sample Interval: 11 to 13 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : MW-POR11-01	Backfill Type NA	Date Backfilled : NA	
Latitude 45.57755130°N	Longitude 122.58587717°W	Elevation (ft) 18.31	
Notes: converted to MW-POR11-01			
Sketch:			
<div style="text-align: right;">NOT TO SCALE</div> <div style="text-align: right;"> </div>			

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR/11-SB 1		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	gravel 1/2" - 1" angular	0.0	NA		
1	Dark grey, silty clay, plastic; moist 2.54 3/0	1.2	POR 11 - SB1-01 @ 0824		
1.5					
2					
2.5					
3		40.2	NA		
3.5					
4					
4.5		17.0			
5					
5.5	same as 0.8"-5'	12.9	NA		
6	gravel 1/2" - 1" angular				
6.5	same as 0.8"-5'	36.1			
7					
7.5					
8		4.7			
8.5					
9		12.9			
9.5					
10		10.0			

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR11-SB 1		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5	Same as 0.8' - 5' ↓ water ↓ END	17.1			
11.0					
11.5					
12.0		0.9	POR11-SB1-02 @ 0830		
12.5					
13.0		1.1			
13.5					
14.0		0.7			
14.5					
15.0		15.0			
15.5					
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR011-SB 1		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFO5/PFDA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	PORP11-SB1
SAMPLE LOCATION:	PBL 11 - Burn Pit
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
Sample No. 1	
SAMPLE ID NUMBER:	PORP11-SB1-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	1.2	ppm

Date/Time: May 23, 2018 0821

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
Sample No. 2	
SAMPLE ID NUMBER:	PORP11-SB1-02
SAMPLE DEPTH (FT):	11-13

FIELD	READING	UNITS
PID	1.1	ppm

Date/Time: May 23, 2018 0830

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY: Denee Athay <i>Denee Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leldos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR011-SB3
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL 11 West side of burn pit	
Date/Time Started : May 23, 2018 0836		Date/Time Finished : May 23, 2018 0850	
Overburden Thickness 6" gravel	Depth to Groundwater (ft) 13'	Total Depth (ft) 11-13'	
Sample for PFOS/PFOA Analysis Sample ID: POR011-SB3-01 Sample Interval: 0 to 2 ft 0.5 - 2.5'		Sample for PFOS/PFOA Analysis Sample ID: POR011-SB3-02 Sample Interval: 11 to 13 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite, 1' cement	Date Backfilled : May 23, 2018	
Latitude 45.57764469°W	Longitude 122.58600940°W	Elevation (ft) 23.64	
Notes:			
<p>Sketch:</p> <p style="text-align: right;">NOT TO SCALE</p>			

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR011-SB3		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	<u>1/4" - 1" angular gravel</u>	0.2			
1	Brownish-grey Silty clay, med moisture, high plasticity 2.54R4 1/2	↓	POR11- SB3-01 @0840		
1.5					
2					
2.5					
3		0.3			
3.5		↓			
4					
4.5					
5					
5.5	<u>Dark grey silty clay, moist, plastic 2.54R 4/0</u>	3.6			
6	<u>1/2" - 1" angular gravel</u>				
6.5	<u>Same as 5-5.5'</u>				
7	↓	15.7			
7.5					
8					
8.5					
9		0.5			
9.5					
10	↓	0.4			

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR011-SB3		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5	Same as 5-5.5'	0.3			
11.0	↓				
11.5	1/2" - 1" angular gravel		POR11-SB3-02		
12.0			@ 0847		
12.5	↓				
13.0	WET				
13.5					
14.0					
14.5	↓				
15.0	END				
15.5					
16.0					
16.5					
17.0					
17.5					
18.0		DA			
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR011-SB 3		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	PORØ11-SB3
SAMPLE LOCATION:	PRE11- Burr Pit
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data		Sample No. 1
SAMPLE ID NUMBER:	PORØ11-SB3-01	
SAMPLE DEPTH:	0-2'	

FIELD	READING	UNITS
PID	0.2	ppm

Date/Time: May 23, 2018 0840

6" - 2.5'

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data		Sample No. 2
SAMPLE ID NUMBER:	PORØ11-SB3-02	
SAMPLE DEPTH (FT):		

FIELD	READING	UNITS
PID	0.3	ppm

Date/Time: May 23, 2018 0836

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY: Danae Athay <i>Danae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR04-SB2
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL 04 West Side of B255	
Date/Time Started : May 23, 2018 0917		Date/Time Finished : May 23, 2018 0935	
Overburden Thickness 6" asphalt	Depth to Groundwater (ft) 12'	Total Depth (ft) 15'	
Sample for PFOS/PFOA Analysis		Sample for PFOS/PFOA Analysis	
Sample ID: POR04-SB2-01 @0920		Sample ID: POR04-SB2-02 @0930	
Sample Interval: 0 to 2 ft 0.5-2.5		Sample Interval: 10 to 12 ft	
Inspector Name Danae Athay		Inspector Signature <i>Danae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite, 1' asphalt patch	Date Backfilled : May 23, 2018	
Latitude 45.57850273°N	Longitude 122.59207209°W	Elevation (ft) 70.25'	
Notes:			
Sketch:			

Client/Installation ANG/PORTLAND ANG		Borehole Number PORO4-SB 2		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	gravel / asphalt	0.0	NA		
1	Tight Dark grey	↓	PORO4-		
1.5	clay, plastic,		SB2-01		
2	low moisture		@0920		
2.5	2.54R 4/0				
3			NA		
3.5					
4					
4.5					
5					
5.5	Same as above	0.0	NA		
6		↓			
6.5	Medium grey clay,				
7	med. moisture, high				
7.5	plasticity				
8	2.54 4/0				
8.5	Med grey clay, med				
9	moisture, high				
9.5	plasticity w/red				
10	mottles 104R 4/0				

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>4-SB 2</u>		Page Page <u>3</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: <u>May 23, 2018</u>	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5	Same as 8-10' but silty clay	00	PORO4-SB2-02 @0930		
11.0					
11.5					
12.0	Wet				
12.5	Same as 8-10' but loose, wet Silty clay		NA		
13.0					
13.5					
14.0					
14.5					
15.0	END				
15.5					
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR04-SB 2		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25		DA			
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR04-SB 2
SAMPLE LOCATION:	PR04 - West of B255
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
SAMPLE ID NUMBER:	POR04-SB2-01
SAMPLE DEPTH:	0.9-2.5'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 23, 2018 0920

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
SAMPLE ID NUMBER:	POR04-SB2-02
SAMPLE DEPTH (FT):	10-12

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 23, 2018 0930

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY: Denae Athay <i>Denae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number MW POR 10-SB 01
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page <u>1</u> of <u>4</u>
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL 10 SW of Two Ponds	
Date/Time Started : May 23, 2018 borehole: 1038 Well: 1050		Date/Time Finished : May 23, 2018 borehole: 1048 Well: 1116	
Overburden Thickness 4"	Depth to Groundwater (ft) 8	Total Depth (ft) 15	
Sample for PFOS/PFOA Analysis Sample ID: POR 10-SB 01-01 Sample Interval: 0 to 2 ft @ 1041		Sample for PFOS/PFOA Analysis Sample ID: POR 10-SB 01-02 @ 1046 Sample Interval: 6 to 8 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : MW-POR 10-01	Backfill Type NA	Date Backfilled : NA	
Latitude 45.57906088° N	Longitude 122.60288096° W	Elevation (ft) 10.65'	
Notes:			
Sketch:			

Client/Installation ANG/PORTLAND ANG		Borehole Number POR10-SB 1-01		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	grass	0.0	MW POR10- SB1-01 @1041		
1	Light brown, very dry sand, no plasticity				
1.5					
2	54R 5/3		NA		
2.5					
3					
3.5					
4	Light brown and black sand, slightly moist, no plasticity				
4.5	54R 4/2				
5					
5.5	Brown/Black Sand	0.0	MW POR10- SB1-02 @1046		
6	Moist, No Plasticity				
6.5	54R 3/2				
7					
7.5					
8	Wet				
8.5	Tight, Dark Grey Clay 54R 3/1		NA		
9	high plasticity				
9.5					
10					

Client/Installation ANG/PORTLAND ANGR		Borehole Number MWPOD 10-SB 1		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFO5/PFOA		Inspector Name Denae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5	Dark brown wet Sand, no plasticity 7.5 YR 3/2	0.0	NA		
11.0					
11.5					
12.0					
12.5					
13.0	Med grey clay, Wet, plastic 7.5 YR 2/0				
13.5					
14.0					
14.5					
15.0					
15.5	END				
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number MW PORØ 10-SB 1		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 23, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	MW POR010-SB01
SAMPLE LOCATION:	SW of Pond 2 - PRL10
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	Sample No. 1
SAMPLE ID NUMBER:	POR010-SB1-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 23, 2018 1041

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	Sample No. 2
SAMPLE ID NUMBER:	MW POR010-SB1-02
SAMPLE DEPTH (FT):	6-8

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 23, 2018 1046

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS: sample collected from borehole drilled prior to MW installation

RELINQUISHED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
Denae Athay <i>Denae Athay</i>			
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR07-SB1
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Size and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL 07 NE corner B380	
Date/Time Started : May 22, 2018 1203		Date/Time Finished : May 22, 2018 1215	
Overburden Thickness 6"	Depth to Groundwater (ft) 7.5	Total Depth (ft) 10	
Sample for PFOS/PFOA Analysis Sample ID: POR07-SB1-01 Sample Interval: 0 to 2 ft @ 1205		Sample for PFOS/PFOA Analysis Sample ID: POR07-SB1-02 Sample Interval: 5.5 to 7.5 ft @ 1213	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite, 1' cement	Date Backfilled : May 22, 2018	
Latitude 45.58181325° N	Longitude 122.59932612° W	Elevation (ft) 16.85'	
Notes:			
Sketch: <p>The sketch is a hand-drawn diagram on a grid. It shows a large, irregular polygon labeled 'B380'. Inside this polygon, there is a smaller, roughly rectangular area labeled 'grassy area'. A dot is placed within the 'grassy area' and labeled 'POR07-SB1'. A line extends from the 'grassy area' towards the top right corner of the sketch, labeled 'Apron'. In the bottom right corner of the sketch area, there is a north arrow pointing upwards, labeled 'N', and the text 'NOT TO SCALE'.</p>			

Client/Installation ANG/PORTLAND ANG		Borehole Number PORO 7-SB 1		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	grass	0.0	PORO7-SB1-01 @ 1205		
1	Light brown, very dry sandy, silty topsoil 54R 5/4				
1.5					
2					
2.5	Med grey and black Sand, low moisture, no plasticity 104R 6/2				
3					
3.5	Brown, grey, and black moist sand, no plasticity 104R 4/2		NA		
4					
4.5					
5					
5.5	Same as above	0.0	NA		
6					
6.5	same as 6"-2'		PORO7-SB1-02 @		
7	same as 5'-6'				
7.5	WET				
8					
8.5					
9			NA		
9.5					
10	Dark grey wet sand 2.54 3/0				

END

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR07-SB 1		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5					14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR07-SB1		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

DA

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR07-SB 1
SAMPLE LOCATION:	PRL7 - NE B380
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
SAMPLE ID NUMBER:	POR07-SB 1-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1205

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
SAMPLE ID NUMBER:	POR07-SB 1-02
SAMPLE DEPTH (FT):	5.5 - 7.5

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1213

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

DA

RELINQUISHED BY: Denae Athay <i>Denae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR07-SB2
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller: Stratus ANG/PORTLAND ANGB	Page 1 of 4
Size and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL 07 8E corner B380	
Date/Time Started : May 22, 2018 1218		Date/Time Finished : May 22, 2018 1240	
Overburden Thickness 18" concrete	Depth to Groundwater (ft) 8'	Total Depth (ft) 10'	
Sample for PFOS/PFOA Analysis Sample ID: POR07-SB2-01 Sample Interval: 0 to 2 ft @ 1230		Sample for PFOS/PFOA Analysis Sample ID: POR07-SB2-02 Sample Interval: 6 to 8 ft @ 1235	
Inspector Name Danae Athay		Inspector Signature <i>Danae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite / 1' cement	Date Backfilled : May 22, 2018	
Latitude 43.58142405°N	Longitude 122.59956858	Elevation (ft) 25.98'	
Notes:			
<p>Sketch:</p> <p>The sketch is a hand-drawn diagram on a grid background. It shows a 'grassy area' on the left side, indicated by wavy lines. A 'concrete' area is on the right, also with wavy lines. A structure labeled 'B380' is in the upper middle. A 'DPT Geoprobe' is shown as a vertical line with a small square at the bottom, representing the borehole. An 'electric box' is drawn as a rectangle near the borehole. A compass rose in the bottom right corner shows North (N), South (S), East (E), and West (W). The text 'NOT TO SCALE' is written near the compass rose.</p>			

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 7-SB 2		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	Medium brown, grey, black sand and clay 104R 6/2 low plasticity	D.O ↓	PORO 7-SB 2-01 @1230	* Depth starts below the 18" concrete	
1					
1.5					
2					
2.5	Medium brown, grey, and black moist sand, no plasticity 104R 6/2		NA		
3					
3.5					
4					
4.5					
5					
5.5	Same as above	D.O	NA		
6					
6.5	Light grey, very dry silt 104R 6/1		PORO 7-SB 2-02 @1235		
7	Medium brown clay, high plasticity mod. moisture 104R WET 4/2				
7.5					
8					
8.5					
9			NA		
9.5	Dark grey tight clay silty high plasticity 2.54 3/0				
10					

END

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO -SB		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5					14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR07-SB 2		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

DA

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR07-SB 2
SAMPLE LOCATION:	PRL-7 - SE corner B380
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
Sample No. 1	
SAMPLE ID NUMBER:	POR07-SB 2-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1230

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
Sample No. 2	
SAMPLE ID NUMBER:	POR07-SB 2-02
SAMPLE DEPTH (FT):	6-8

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1235

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" Insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

DA

RELINQUISHED BY: Denae Athay <i>Denae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR03-SB1
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL03 West side of B250	
Date/Time Started : May 22, 2018 1434		Date/Time Finished : May 22, 2018 1445	
Overburden Thickness 6"	Depth to Groundwater (ft) 7	Total Depth (ft) 10	
Sample for PFOS/PFOA Analysis Sample ID: POR03-SB1-01 Sample Interval: 0 to 2 ft		Sample for PFOS/PFOA Analysis Sample ID: POR03-SB1-02 Sample Interval: 5 to 7 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite / 1" cement	Date Backfilled : May 25, 2018	
Latitude 45.57912360°N	Longitude 122.59034283°W	Elevation (ft) 10.34'	
Notes: * Set 3/4" PVC temporary piezometer, removed 5/25/18			
Sketch: 			

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO3-SB1		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFO5/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	grass	0.0	PORO3-		
1	Light brown, dry silt- 20% angular gravel 54R 5/2		SB1-01 @ 1438		
1.5	Dark brown, loose but dry clay				
2	with red mottles and black nodules				
2.5	54R 2.5/2		NA		
3					
3.5					
4					
4.5	Dark brown, tight, dry clay 54R 2.5/2				
5	same as above	0.0	PORO3-		
5.5	Medium brown, silty clay w/ red nodules		SB1-02 @ 1443 + FD		
6	104R 4/2 high plasticity				
6.5	WET				
7	Medium brown, wet silty clay 104R 4/2				
7.5			NA		
8					
8.5					
9					
9.5					
10	END				

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>3-SB 1</u>		Page Page <u>3</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					
11.0					
11.5					
12.0					
12.5					
13.0					
13.5					
14.0					
14.5					
15.0					
15.5					
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>3</u> -SB <u>1</u>		Page Page <u>0</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR03-SB1
SAMPLE LOCATION:	PRL3 - W side of B250
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
SAMPLE ID NUMBER:	POR03-SB1-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1438

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
SAMPLE ID NUMBER:	POR03-SB1-02
SAMPLE DEPTH (FT):	5-7

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1443
+FD

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY: Denae Athay <i>Denae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos		Borehole Number POR0 <u>3</u>-SB <u>2</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB		Page Page <u>1</u> of <u>4</u>	
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT				Borehole Location Description PRL03 N corner of B250	
Date/Time Started : May 22, 2018 1452			Date/Time Finished : May 22, 2018 1500		
Overburden Thickness 2"		Depth to Groundwater (ft) 7.5		Total Depth (ft) 10	
Sample for PFOS/PFOA Analysis Sample ID: POR0 <u>3</u>-SB <u>2</u>-01 Sample Interval: 0 to 2 ft @ 1452⁰⁰			Sample for PFOS/PFOA Analysis Sample ID: POR0 <u>3</u>-SB <u>2</u>-02 Sample Interval: 5.5 to 7.5 ft @ 1500		
Inspector Name Denae Athay			Inspector Signature <i>Denae Athay</i>		
Monitoring Well ID : NA		Backfill Type 3/8" bentonite / 1' cement		Date Backfilled : May 22, 2018	
Latitude 45.57942133° N		Longitude 122.59017448° W		Elevation (ft) 26.13	
Notes:					
Sketch:					

Client/Installation ANG/PORTLAND ANG		Borehole Number PORO 3-SB 2		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	grass	0.0	PORO3-SB2-01		
1	Dark brown, loose but dry clay with red mottles and black nodules 7.5 4R 3/2		@1454		
2			NA		
2.5					
3					
3.5	Dark brown, moist, plastic silty clay, loose 7.5 4R 3/2				
4					
4.5					
5					
5.5	same as above	0.0	NA		
6	same as 2'-3'		PORO3-SB2-02		
6.5	same as 3-5'		@1500		
7					
7.5	WET				
8	Dark brown, loose, wet, plastic silty clay 7.5 4R 3/2		NA		
8.5					
9					
9.5					
10	END				

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR03-SB 2		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date:	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5		DA			14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>3-SB2</u>		Page Page <u>4</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date:	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25					
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR03-SB 2
SAMPLE LOCATION:	PRL3-N corner B250
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
Sample No. 1	
SAMPLE ID NUMBER:	POR03-SB 2-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1454

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
Sample No. 2	
SAMPLE ID NUMBER:	POR03-SB 2-02
SAMPLE DEPTH (FT):	5.5-7.5

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1500

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY:

Denae Athay

COMPANY Leldos

DATE/TIME

RELINQUISHED BY:

COMPANY

DATE/TIME

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR04-SB3
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL04 NE side of B255	
Date/Time Started : May 22, 2018 1516		Date/Time Finished : May 22, 2018 1540	
Overburden Thickness 18" asphalt	Depth to Groundwater (ft) 8'	Total Depth (ft) 10	
Sample for PFOS/PFOA Analysis Sample ID: POR04-SB3-01 @ 1529 Sample Interval: 0 to 2 ft		Sample for PFOS/PFOA Analysis Sample ID: POR04-SB3-02 @ 1533 Sample Interval: 6 to 8 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite / 1" asphalt patch	Date Backfilled :	
Latitude 45.57870706°N	Longitude 122.59125849°W	Elevation (ft) 11.35	
Notes: * set 3/4" PVC temporary piezometer * depths are from below 18" asphalt			
Sketch: 			

Client/Installation ANG/PORTLAND ANGE		Borehole Number PORO4-SB3		Page Page 2 of 4
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes
0.5	Dark grey sand/gravel (60% small, angular) Moist, low plasticity 2.5y 3/0	0.0	PORO4-SB3-01 @ 1529	* Depths start below the 18" asphalt
1				
1.5	Dark grey, very tight, high plasticity clay 7.5 4R 3/0			
2				
2.5				
3				
3.5			NA	
4				
4.5				
5				
5.5	Same as above	0.0	NA	
6	Medium grey, loose, moist clay, low med plasticity 5.4R 4/1			
6.5			PORO4-SB3-02 @ 1533	
7				
7.5	Soft, loose, moist, dark grey clay 7.5 4R 3/0 <u>wet</u>			
8				
8.5	Dark grey, wet, silty clay 7.5 4R 3/0			
9			NA	
9.5				
10	END			

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>4-SB 3</u>		Page Page <u>3</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: <u>May 22, 2018</u>	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5					14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO4-SB3		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	PORO 4-SB 3
SAMPLE LOCATION:	PRLO4- NE Side B255
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
Sample No. 1	
SAMPLE ID NUMBER:	PORO 4-SB 3-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1529

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
Sample No. 2	
SAMPLE ID NUMBER:	PORO 4-SB 3-02
SAMPLE DEPTH (FT):	6-8'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 22, 2018 1533

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY:
Denae Athay *Denae Athay*
COMPANY Leidos

DATE/TIME

RELINQUISHED BY:

DATE/TIME

COMPANY

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR0 <u>8</u>-SB <u>1</u>
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page <u>1</u> of <u>4</u>
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRLO8 NW Corner B375	
Date/Time Started : May 24, 2018 0803		Date/Time Finished : May 24, 2018 0815	
Overburden Thickness 1"	Depth to Groundwater (ft) 7	Total Depth (ft) 10	
Sample for PFOS/PFOA Analysis		Sample for PFOS/PFOA Analysis	
Sample ID: POR0 <u>8</u> -SB <u>1</u> -01 @ 0805 Sample Interval: 0 to 2 ft + HS/MSD		Sample ID: POR0 <u>8</u> -SB <u>1</u> -02 @ 0812 Sample Interval: <u>5</u> to <u>7</u> ft + FD	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : MW-POR08-01	Backfill Type 3/8" bentonite / cement	Date Backfilled : May 24, 2018	
Latitude 43-58257790°N	Longitude 122.60115037°W	Elevation (ft) 12.87	
Notes:			
Sketch:			

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 8-SB 1		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 24, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	grass Dry, light brown silt 5YR 5/2	0.0	PORO8-SB1-01 @ 0805 +MS/MSD		
1	Brown and black sand, moist, no plasticity 5YR 4/1	↓	NA		
1.5					
2					
2.5					
3	Same as above	↓	PORO8-SB1-02 @ 0812 +FD		
3.5					
4					
4.5					
5	Same as 2-6" with 1" rocks (5%) WET	↓			
5.5					
6					
6.5					
7	Brown and black wet sand 5YR 4/1	↓			
7.5					
8					
8.5					
9	Brown and black wet sandy clay 5YR 4/1	↓			
9.5					
10					

END

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 8-SB 1		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 24, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					
11.0					
11.5					
12.0					
12.5					
13.0					
13.5					
14.0					
14.5		DA			
15.0					
15.5					
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORD 7-SB 1		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFO5/PFOA		Inspector Name Danae Athay		Date: May 24, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR08-SB 1
SAMPLE LOCATION:	PRL8 - NW corner B375
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data		Sample No. 1
SAMPLE ID NUMBER:	POR08-SB 1-01	
SAMPLE DEPTH:	0-2'	

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 24, 2018 0805

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data		Sample No. 2
SAMPLE ID NUMBER:	POR08-SB 1-02	
SAMPLE DEPTH (FT):	5-7	

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 24, 2018 0812

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

ON

RELINQUISHED BY: Denae Athay <i>Denae Athay</i>	DATE/TIME	RELINQUISHED BY:	DATE/TIME
COMPANY Leidos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR08-SB2
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Size and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL08 NE corner of B375	
Date/Time Started : May 24, 2018 1000		Date/Time Finished : May 24, 2018 1010	
Overburden Thickness 1/2"	Depth to Groundwater (ft) 6.5	Total Depth (ft) 10	
Sample for PFOS/PFOA Analysis Sample ID: POR08-SB2-01 @ 1003 Sample Interval: 0 to 2 ft		Sample for PFOS/PFOA Analysis Sample ID: POR08-SB2-02 @ 1008 Sample Interval: 4.5 to 6.5 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite / 1' cement	Date Backfilled : May 24, 2018	
Latitude 45.58226622°N	Longitude 122.60024807°W	Elevation (ft) 20.73	
Notes:			
<p>Sketch:</p> <p style="text-align: right;">NOT TO SCALE</p>			

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO8-SB 2		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 24, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	grass Dry, light brown silt No plasticity 54R 5/2	0.0	POR08-SB2-01 @ 1003		
1					
1.5	Moist brown and black sand, no plasticity 54R 4/1				
2					
2.5					
3			NA		
3.5					
4					
4.5					
5			POR08-SB2-02 @ 1008		
5.5	same as above	0.0			
6					
6.5	same as 0-1' WET				
7	Wet brown and black sand, no plasticity 54R 4/1		NA		
7.5					
8					
8.5					
9					
9.5	1/2" wet gravel				
10	END				

Client/Installation ANG/PORTLAND ANG		Borehole Number PORO 8-SB 2		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 24, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5					14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 8-SB 2		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 24, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25					
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR08-SB2
SAMPLE LOCATION:	PRL08-NE corner B375
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	Sample No. 1
SAMPLE ID NUMBER:	POR08-SB2-01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 24, 2018 1003

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	Sample No. 2
SAMPLE ID NUMBER:	POR08-SB2-02
SAMPLE DEPTH (FT):	4.5-6.5

FIELD	READING	UNITS
PID	0	ppm

Date/Time: May 24, 2018 1008

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY:
Denae Athay *Denae Athay*
COMPANY Leidos

DATE/TIME

RELINQUISHED BY:

DATE/TIME

COMPANY

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number MW PORO 4-SB 01
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PR L04 NW corner of B255	
Date/Time Started : May 22, 2018		Date/Time Finished : May 22, 2018	
Overburden Thickness 6" asphalt	Depth to Groundwater (ft) 12ft 8'	Total Depth (ft) 15'	
Sample for PFOS/PFOA Analysis Sample ID: PORO SB -01 Sample Interval: 0 to 2 ft		Sample for PFOS/PFOA Analysis Sample ID: PORO SB -02 Sample Interval: 0 to 2 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : da MW-PORO4-SPO1	Backfill Type NA	Date Backfilled : NA	
Latitude	Longitude	Elevation (ft)	
Notes: 3/4" Temporary PVC Piezometer installed, converted to well 5/25			
Sketch: 			

Client/Installation ANG/PORTLAND ANGB		Borehole Number MW POR04-SB 01		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
0.5	gravel	0.0	NA		
1	Tight, low moisture				
1.5	high plasticity,				
2	dark grey clay				
2.5	with a little silt				
3	2.5 4R 4/0				
3.5					
4					
4.5					
5	Tight grey silty clay 2.5 4R 4/0				
5.5	same as above	0.0	NA		
6	Medium grey clay with				
6.5	red mottles, high				
7	plasticity, low				
7.5	moisture 10 4R 4/0				
8	WET				
8.5	Medium grey silty clay				
9	loose, wet 10 4R 4/0				
9.5					
10					

Client/Installation ANG/PORTLAND ANGB		Borehole Number MW PORO 4-SB 01		Page Page 3 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 22, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes:	
10.5	Medium grey silty clay high moisture, high plasticity, wet, loose 104R 4/0 WET	0.0	NA		
11.0					
11.5					
12.0					
12.5					
13.0					
13.5					
14.0					
14.5					
15.0					
15.5	END				
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO -SB		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date:	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					20.5
21					21.0
21.5					21.5
22					22.0
22.5					22.5
23					23.0
23.5					23.5
24					24.0
24.5					24.5
25					25.0
25.5					25.5
26					26.0
26.5					26.5
27					27.0
27.5					27.5
28					28.0
28.5					28.5
29					29.0
29.5					29.5
30					30.0

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	POR0 -SB
SAMPLE LOCATION:	
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	Sample No. 1
SAMPLE ID NUMBER:	POR0 -SB -01
SAMPLE DEPTH:	0-2'

FIELD	READING	UNITS	
PID		ppm	

Date/Time: _____

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	

Sample Data	Sample No. 2
SAMPLE ID NUMBER:	POR0 -SB -02
SAMPLE DEPTH (FT):	

FIELD	READING	UNITS	
PID		ppm	

Date/Time: _____

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
Denae Athay			
COMPANY Leldos		COMPANY	

Client/Installation ANG/PORTLAND ANGB		Oversight Contractor Leidos	Borehole Number POR04-SB 1
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Driller : Stratus ANG/PORTLAND ANGB	Page Page 1 of 4
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822 DT		Borehole Location Description PRL4 SW corner of B255	
Date/Time Started : May 25, 2018 0957		Date/Time Finished : May 25, 2018 1008	
Overburden Thickness 18" asphalt	Depth to Groundwater (ft) 9'	Total Depth (ft) 10'	
Sample for PFOS/PFOA Analysis		Sample for PFOS/PFOA Analysis	
Sample ID: POR04-SB 1-01 (top 1.5' is asphalt) <small>on site</small>		Sample ID: POR04-SB 1-02 @ 1006	
Sample Interval: 0 to 2 ft 1.5-3.5 @ 0957		Sample Interval: 7 to 9 ft	
Inspector Name Denae Athay		Inspector Signature <i>Denae Athay</i>	
Monitoring Well ID : NA	Backfill Type 3/8" bentonite, 1' asphalt	Date Backfilled : May 25, 2018	
Latitude 45.57818908°N	Longitude 122.59202901°W	Elevation (ft) 14.29'	
Notes:			
Sketch:			

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO 4-SB 1		Page Page 2 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 25, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
0.5	asphalt	D.O.	NA		
1					
1.5					
2					
2.5	Dark grey, tight, dry, plastic clay 2.5 VR 4/0	D.O.	POR04		
3			POR04 SB1-D1 @ 1000		
3.5					
4					
4.5	Same as 1.5-5'	D.O.	NA		
5					
5.5					
6					
6.5	Medium grey, dry, plastic clay, red mottles 10 VR 4/0 Wet	D.O.	POR04-SB1-D2 @ 1006		
7					
7.5					
8					
8.5	Medium grey, loose wet clay 10 VR 4/0	D.O.	NA		
9					
9.5					
10					

END

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>4-SB 1</u>		Page Page <u>3</u> of <u>4</u>	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: May 25, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
10.5					10.5
11.0					11.0
11.5					11.5
12.0					12.0
12.5					12.5
13.0					13.0
13.5					13.5
14.0					14.0
14.5					14.5
15.0					15.0
15.5					15.5
16.0					16.0
16.5					16.5
17.0					17.0
17.5					17.5
18.0					18.0
18.5					18.5
19.0					19.0
19.5					19.5
20.0					20.0

Client/Installation ANG/PORTLAND ANGB		Borehole Number POR04-SB 1		Page Page 4 of 4	
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Danae Athay		Date: May 25, 2018	
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes	
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25					
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					

SAMPLE COLLECTION/CHAIN-OF-CUSTODY RECORD

PROJECT NAME: PORTLAND ANG

DELIVERY ORDER 0011

Borehole Data	
SAMPLING POINT:	PORO 4-SB 1
SAMPLE LOCATION:	PRL 4-SW Corner of B255
SAMPLE MEDIA:	Soil
SAMPLE TYPE	Grab
LOGBOOK NUMBER:	1

SAC - TestAmerica Sacramento

Sample Data	
Sample No. 1	
SAMPLE ID NUMBER:	PORO 4-SB 1-01
SAMPLE DEPTH:	0-2' DB 18"-3.5'

FIELD	READING	UNITS
PID	0	ppm
Date/Time: May 25, 2018 1000		

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

Sample Data	
Sample No. 2	
SAMPLE ID NUMBER:	PORO 4-SB 1-02
SAMPLE DEPTH (FT):	7-9'

FIELD	READING	UNITS
PID	0	ppm
Date/Time: May 25, 2018 1006		

NO. CONTAINERS & VOLUME	CONTAINER TYPE	ANALYSIS	PRESERVATION TYPE (TYPE/VOL)	LABORATORY	COLLECTION CODE**
1-4oz	plastic	PFOS/PFOA	cold, no preservative	SAC	X

** "X" analysis collected; "IS" insufficient volume; "NR" not required; define other code as appropriate

COMMENTS:

RELINQUISHED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
Denae Athay <i>Denae Athay</i>	5/25/18		
COMPANY Leidos	1800	COMPANY	

Client/Installation ANG/PORTLAND ANGB	Oversight Contractor Leidos	Borehole Number POR0 <u>2</u>-SB <u>2</u>
Project FY17 Phase 3 Regional SI for PFOS/PFOA	Driller : Stratus ANG/PORTLAND ANGB	Page Page <u>1</u> of <u>4</u>
Sizes and Type of Drilling and Sampling Equipment DPT Geoprobe 7822DT		Borehole Location Description PRL 2 North side of B180
Date/Time Started : May 25, 2018 1358		Date/Time Finished : May 25, 2018 1410^{PM} 5/25 1415
Overburden Thickness 6" concrete	Depth to Groundwater (ft) 7 1/2	Total Depth (ft) 10
Sample for PFOS/PFOA Analysis		Sample for PFOS/PFOA Analysis
Sample ID: POR0 <u>2</u> -SB <u>2</u> -01 @ 1407		Sample ID: POR0 <u>2</u> -SB <u>2</u> -02 @ 1412
Sample Interval: 0 to 2 ft		Sample Interval: <u>5 1/2</u> to <u>7 1/2</u> ft
Inspector Name Denae Athay		Inspector Signature
Monitoring Well ID : NA	Backfill Type 3/4" bentonite, 1' concrete	Date Backfilled : May 25, 2018
Latitude 45.57882000°N	Longitude 122.59535529°W	Elevation (ft) 4.55'
Notes: Depth measured below concrete		
Sketch:		
<p>NOT TO SCALE</p>		

Client/Installation ANG/PORTLAND ANGB		Borehole Number PORO <u>2-SB 2</u>		Page Page <u>2</u> of <u>4</u>
Project FY17 Phase 3 Regional SI for PFOS/PFOA		Inspector Name Denae Athay		Date: <u>May 25, 2018</u>
Depth	Description of Materials	Headspace Reading (ppm)	Analytical Sample Interval	Notes
0.5	Tight, dry, plastic dark grey clay 2.5 YR 4/0	0.0	POR02- SB2-01 @ 1407	Depth measurements start below 6" concrete
1				
1.5	sand lens			
2	same as 0-1 1/2'			
2.5			NA	
3	Tight, dry, plastic dark brown clay 7.5 YR 3/2			
3.5				
4				
4.5				
5	Medium brown clay 10 YR 4/2	0.0	NA	
5.5				
6	Medium brown and black sand and gravel, moist 10 YR 6/2		POR02- SB2-02 @ 1412	
6.5				
7	Medium brown wet			
7.5				
8	soft wet silty clay 10 YR 4/2		NA	
8.5				
9				
9.5				
10	END			